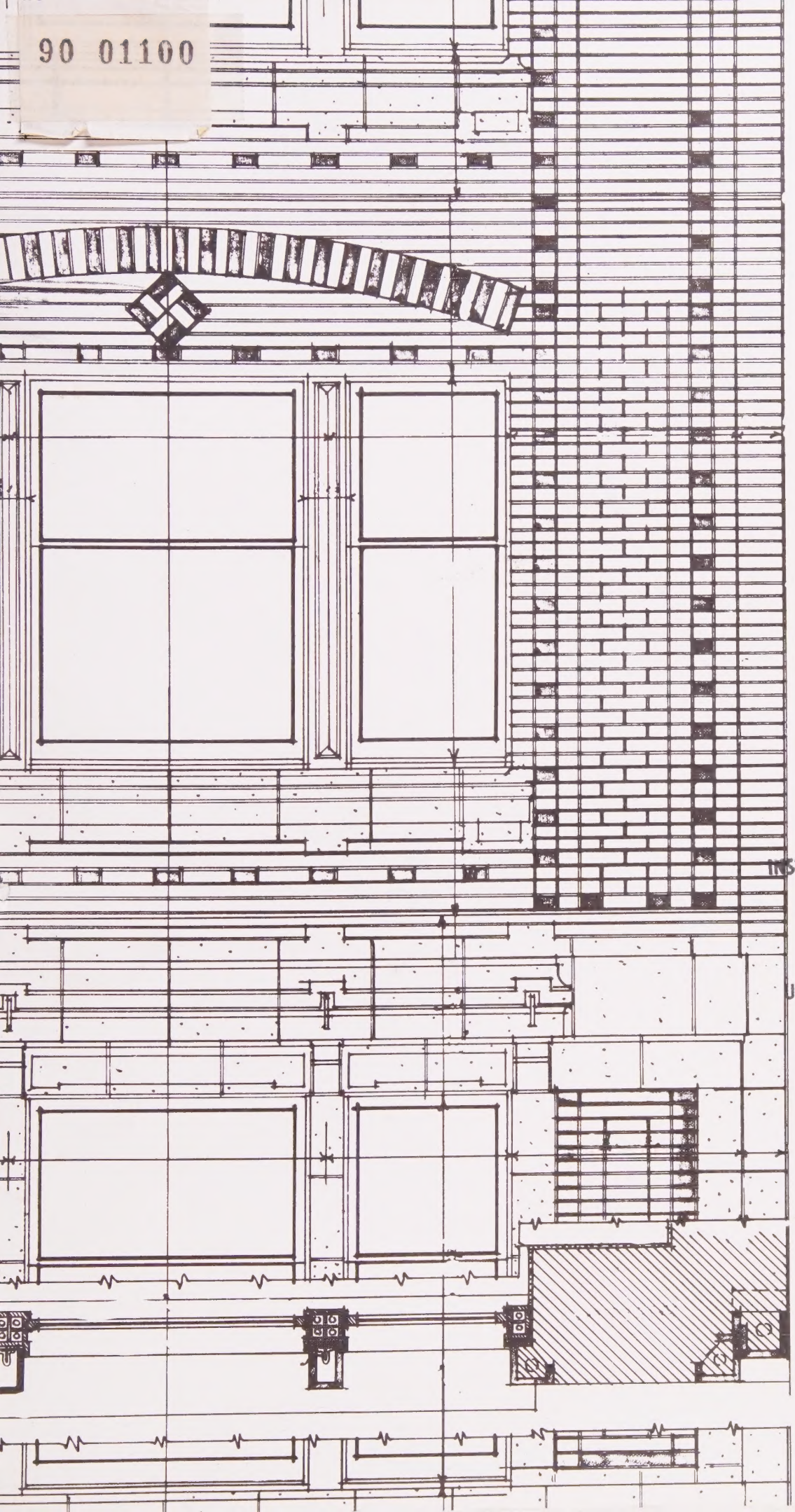

SEISMIC COSTS AND POLICY IMPLICATIONS

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SEISMIC COSTS AND POLICY IMPLICATIONS:

THE COST OF SEISMIC UPGRADING IN UNREINFORCED MASONRY RESIDENTIAL BUILDINGS AND POLICY IMPLICATIONS FOR MAINTAINING AN AFFORDABLE HOUSING STOCK.

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SEISMIC COSTS AND POLICY IMPLICATIONS

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EXECUTIVE SUMMARY

The Earthquake Hazards Reduction Ordinance (EHRO) was enacted in 1981 to protect the public safety by requiring that "unreinforced masonry" (URM) buildings be upgraded to a new code, reflecting the best structural engineering knowledge available. The administration of such an ordinance is typically handled by the Building and Safety Department. However, because a great number of these buildings are apartments and residential hotels, the Community Development Department plays an important role in that the Housing Division provides low-interest financing for the renovations, and Rent Stabilization adjusts rents based on allowable expenditures.

The purpose of this study was fourfold:

- to evaluate actual construction costs on URM residential buildings;
- to evaluate the level of compliance with the ordinance for URM residential buildings;
- to evaluate the impact of the EHRO on tenants and on rents; and
- to evaluate the seismic upgrading program in the context of an overall housing policy.

DEFINITION OF THE PROBLEM

There are approximately 8,000 URM buildings in Los Angeles of which 1,582 are residential. These residential buildings contain some 46,000 housing units. Ninety percent (90%) of the buildings are concentrated in four neighborhood areas:

- Hollywood, Silver Lake, and Echo Park;
- the near downtown and Boyle Heights;
- the Wilshire and Westlake District; and
- South Central Los Angeles.

The majority of these buildings received their notice to comply with the EHRO in 1986[1] This coincided with the City Council

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1. Most residential buildings were defined as medium risk by the EHRO and thus received their citations after essential and high risk buildings were notified. Typically the first to receive notice were public and/or commercial buildings.

decision to speed up the citation process and to reduce the time allotted for compliance in light of the devastation caused by the Mexico City Earthquake.

As a result, building owners were faced with a relatively short compliance period at a time when there was very little experience with either the engineering design or the construction techniques applicable to residential buildings.

The Housing Division of the Community Development Department was committed to a low-interest loan program[2] but they did not have any real basis for evaluating procedures and costs. The same was true for the Rent Stabilization Division. Thus this study was commissioned in order to see that:

1. the rent law was being fairly applied;

2. the City was getting sufficient improvement in the housing stock for its federal dollars;

3. the City would be assured that the funds were appropriately spent for seismic safety; and

4. the City would develop policies to encourage compliance with the EHRO and at the same time, mitigate tenant impacts.

OVERVIEW OF METHODOLOGY

This study began in June of 1987 with a review of the residential building stock and the selection of specific buildings for case studies. Almost all of the 1582 residential buildings are either two, three or four stories.[3] Most of the two story buildings are mixed use, with apartments above a ground floor commercial space, while most of the 3 and 4 story buildings were single use residential buildings. To date, very few of the mixed use buildings, and only a limited number of the hotel buildings, have been renovated and as such, our cost study focused on the typical 3 and 4 story apartment building.

We selected 11 completed buildings which had received funds from CDD, and 4 buildings funded either by CRA or private financing. For each of these buildings we reviewed 1) the Structural and Architectural Construction Documents submitted to Building and

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2. The Community Redevelopment Agency had also begun to set policy and provide housing rehabilitation loans.

3. The great majority are apartment buildings with 30,6000 units. 245 buildings are hotels and these have 15,6000 units.

Safety and 2) the Community Development Department project records including funding expenditures as well as the documentation of costs submitted to substantiate rent increases.

Further we interviewed 1) CDD Division Managers, 2) building owners, 3) contractors and 4) building officials to insure that the cost data was accurate and to develop descriptions of the work on each building that allowed for comparison between buildings.

A draft report on cost was submitted in November of 1987 and this was reviewed extensively within both the Community Development and the Building and Safety Departments. Then in 1988 we used computer tapes from Building and Safety to evaluate the level of compliance among residential building owners. We then used data collected for the 1988 Rent Stabilization Review to describe the characteristics of the neighborhoods where most of the unreinforced masonry residential buildings are concentrated.

FINDINGS

1. Cost

Seismic upgrading for URM residential buildings ranges from $7 to $12 per square foot or $4,000 to $7,000 per unit. This is significantly more than was originally estimated by Building and Safety and significantly more than the permit valuation[4] in almost every case.

Further, we found that the total amount spent on rehabilitation was much higher than the seismic upgrading cost for CDD funded buildings. The total project costs ranged from $12 to $45 per square foot or $10,000 to $20,000 per unit.

Clearly some architectural work is a necessary part of seismic repair but typical seismic costs should be approximately 80% of the total rehabilitation costs. In the CDD funded buildings we reviewed we found the average seismic cost was 43% of the total, and there were several cases where building owners took advantage of CDD funds to perform major cosmetic upgrades on their buildings.

2. Compliance

The majority (95%) of the residential buildings received their notice to comply with the EHRO by September of 1986. To meet the timeline established by the City Council in 1985:

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4. The permit valuation is the construction cost estimated by Building and Safety in order to determine the fees charged.

- o all permits should have been secured by June of 1988, and
- o all construction should have been started by December 1988.

In fact:
- 24% have completed construction
- 59% are in process[5] but have not yet started construction
- 8% have been demolished, and
- 9% have not responded.

The last two categories represent 3,700 housing units which have been lost, and 4,400 units which are in serious jeopardy. Further it is not clear that all owners who have submitted plans and/or obtained permits will actually complete the renovation, given that 67% have not yet started construction.

3. Neighborhood Conditions

In the Hollywood, Silver Lake, Echo Park, Wilshire and Westlake Districts the tenants are primarily white, single, elderly, and poor. Two-thirds have incomes under $30,000 per year and 51% have lived in the same unit for at least 9 years.

In the near downtown, Boyle Heights and South Central Los Angeles, the tenants are primarily poor Hispanic and Black families, living in overcrowded conditions. 20% have incomes less than $10,000, 60% have incomes less than $20,000 per year.

In all these areas tenants pay significantly less rent ($399 to $483 per month) than other areas of the city, and they pay a much higher percentage of their income on rent. The rent-to-income ratio for these tenants ranges form 39% to 58% compared to the average of 29%.[6]

RECOMMENDATIONS

Given that the structural requirements to retrofit established in the EHRO are already very close to a minimum acceptable standard for safety, and that the age and condition of the majority of the URM residential buildings are quite similar, there is very little

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5. Of these, 42% have received permits, 7% have submitted plans only.

6. 1988 Rent Stabilization Review, Community Development Department, City of Los Angeles.

that can be done to bring down the construction cost of the retrofit. In fact we have found that these costs are likely to increase because 1) there is a demand for the work and an insufficient number of qualified contractors, and 2) the mixed use buildings are smaller and more complex, with fewer units to absorb the costs.

Still, addressing the issue of cost is critical. Excessive costs could force owners to consider demolition, just as excessive rent increases will clearly displace existing tenants. As such, simplifying procedures, as well as expediting the funding, approval and inspection process are the only real means of achieving cost reductions.

The following recommendations on policies and administrative procedures were developed with five goals in mind:

1. to keep costs down,

2. to save the existing affordable housing stock,

3. to reach the greatest number of building owners,

4. to minimize the impact on tenants during the construction process, and

5. to minimize the impact on tenants' rents while fairly distributing the burden of seismic upgrading costs.

These procedural recommendations fall into 3 categories: funding, standards, and management, and apply to operations in both Housing and Rent Stabilization in CDD and Building and Safety.

FUNDING
- o Cap seismic loan amounts from CDD at the average cost per square foot.
- o Limit the funding for general rehabilitation to essential code work and minimal architectural repair.
- o Establish coordinated funding jurisdictions between CDD and CRA.
- o Have an engineer in CDD who sets the "acceptable range" in terms of engineering design and cosmetic rehabilitation.

STANDARDS
- o CDD should provide owners with a list of acceptable engineers, who conform to established standards.

- Building and Safety should charge fees commensurate with actual construction costs.

MANAGEMENT

- Give occupied residential buildings priority in plan check.
- Allow standardized details (developed by Building and Safety) to be used in change orders.
- Have Building and Safety set aside time each day for processing changes.
- Coordinate documents and submittals with all departments involved.
- Require a building walk-through for the project team before loans are approved and permits given.
- Require owners to file a Tenant Inconvenience and/or temporary relocation plan with Rent Stabilization before a building permit is issued.
- Simplify the rent-increase application process.
- Allow only real finance costs on cited rehabilitation when computing rent increase.

Finally, some policy changes are needed to augment procedural and management improvements. In order to save a significant portion of the existing URM residential stock,

THE CITY SHOULD IMPLEMENT DEMOLITION CONTROL.

While there are many ways the City could structure such a policy, the focus should be on keeping the existing inner city stock as affordable housing.

Further, to serve the greatest number of building owners and tenants,

THE CITY SHOULD LIMIT THE FINANCING IT PROVIDES TO SEISMIC AND OTHER CRITICAL CODE REQUIREMENTS.

The City simply does not have the resources to provide financing for cosmetic building improvements.

Finally, in order to minimize the impact on tenants in these buildings,

THE CITY SHOULD LIMIT RENT INCREASES TO $100 PER MONTH OR LESS.

The intention here is not to penalize the building owner, but simply to recognize that in cases where actual costs can create very high rent increases, it is important to minimize the impact on tenants who already pay a high proportion of their income in rent, by having tenants pay a lower rent increase over a longer period of time.

CONCLUSION

In summary, the Earthquake Hazards Reduction Ordinance is an important measure designed to protect the life-safety of the Citizens of Los Angeles. When it was developed, it was not possible to foresee all the ramifications of its enforcement. Thus, this report reviewed the specific impact the Earthquake Hazards Reduction Ordinance has had on residential buildings. The study found that:

1. The cost of seismic upgrading was higher than originally anticipated by Building and Safety;

2. Less than one-quarter of the residential buildings have been completed in the time frame allocated; and

3. The majority of the residential buildings affected are concentrated in central city neighborhoods (Hollywood, Wilshire, Westlake and Downtown) populated by poor, elderly and ethnic minority tenants.

As such, the study recommends several steps to improve and streamline administrative procedures both within and between Community Development and Building and Safety. In addition, we recommend policy changes to insure that the existing inner-city affordable housing stock is not demolished by a process designed to improve the building stock and extend its useful life. The proposals and recommendations contained in this study recognize seismic safety and housing conservation as important policy priorities for the City of Los Angeles.

I. INTRODUCTION AND OBJECTIVES

The administration of the Earthquake Hazards Reduction Ordinance is viewed by most citizens and city officials as an activity wholly within the purview of the Building and Safety Department. However, for building owners and tenants in unreinforced masonry (URM) buildings, the Community Development Department plays an important role. The Housing Division provides low interest loans to many building owners, and the Rent Stabilization Division works with all landlords and tenants to adjust rents based on allowable upgrading expenditures. Thus, a clear understanding of the seismic upgrading cost in unreinforced masonry buildings is critical to the Community Development Department in order to see that:

1. The rent law is fairly applied.
2. The City is getting sufficent improvements in the housing stock for its federal dollars.
3. The City is assured that money is being spent appropriately for seismic safety and related improvements.
4. Alternative policies are developed to encourage compliance and mitigate tenant impacts.

The main purpose of the study is to evaluate the actual construction costs of a representative sample of buildings that have received City funding, and to compare those costs with buildings funded privately.

Of course, it must be pointed out that the study was commissioned in June of 1987. The Community Development Department intended to use the cost data to work with the Building and Safety Department to develop policy that would allow the enforcement of the Earthquake Safety Ordinance without jeopardizing the rights of the tenants and the owners. The aim was to preserve the unreinforced masonry housing stock, as much as possible, and to insure that city funding was used to assist building owners according to need.

Although this goal has not changed, the October 1,1987 earthquake reordered some priorities. Before any review of administration policy, the extent of the damage had to be assessed, repairs made, and people moved back into their homes. The delay in releasing this study after the Whittier earthquake allowed us to look at the new data in the 1988 Rental Housing Review. This opportunity combined with a new emphasis on housing needs (put forward in proposals by Council members Woo and Molina, and the establishment of the

Mayor's Blue Ribbon Committee for Affordable housing) required a re-evaluation of seismic upgrading programs in the context of an overall housing policy.
Thus, the study was expanded to include a review of the cost of seismic upgrading, the impact on rents, and the implications for maintaining an affordable housing stock in the City of Los Angeles. The Cost Survey was conducted during the summer and fall of 1987 and Chapters I-IV and all the Case Studies were written at that time. Chapters V and VI were researched in the fall of 1988 and the final report was assembled in February 1989.

II. CONSTRUCTION COST SURVEY PROCEDURE

To insure that the cost studies would be representive, we developed a profile of all the residential buildings listed in the Hazardous Building Survey, by height, shape, and footprint size. Two basic prototypes emerged: 1) The two-story mixed use (commercial and residential) buildings, and 2) the three and four-story residental buildings[7]. We found that all the CDD funded buildings were in the latter category. We then looked carefully at half of the buildings funded through CDD as well as numerous private developments. In this document, fifteen buildings are described in detailed case studies in order to present typical methods of upgrading, and cost comparisons.

A. Selection of Prototypes

The process of selection can be roughly characterized by three steps; 1) statistical analysis, 2) preliminary selection, 3) confirmation of representative case studies. These steps occurred in the above order, as data became available.

Statistical Analysis

As a first step, an analysis of the data from the Los Angeles Hazardous Building Survey has been conducted to find the most common types of residential unreinforced masonry buildings. For the purpose of assessing seismic cost, types of unreinforced masonry (URM) building can be grouped according to factors which substantially affect costs. The dominant factors are the number of stories, the configuration, and the footprint size. Building occupancy also has been analyzed to determine the percentage of mixed-use versus single use buildings. This ultimately will affect the financial scheme, and funding sources for retrofit.

Figure 1 shows the distribution of the number of stories and the shape of the 1582 residential URM's in Los Angeles. The data indicate that almost all of the buildings are either two, three or four stories, with the number of two stories roughly equal to the number of three and four stories combined. Yet, most of the buildings being assisted by CDD are three and four stories, primarily because these buildings are 100% residential. Figure 2 is a comparison of building stories and usage, showing that most of the two story buildings involve mixed-use, probably containing

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7. The great majority in both prototypes were rectangular and of average foot print size.

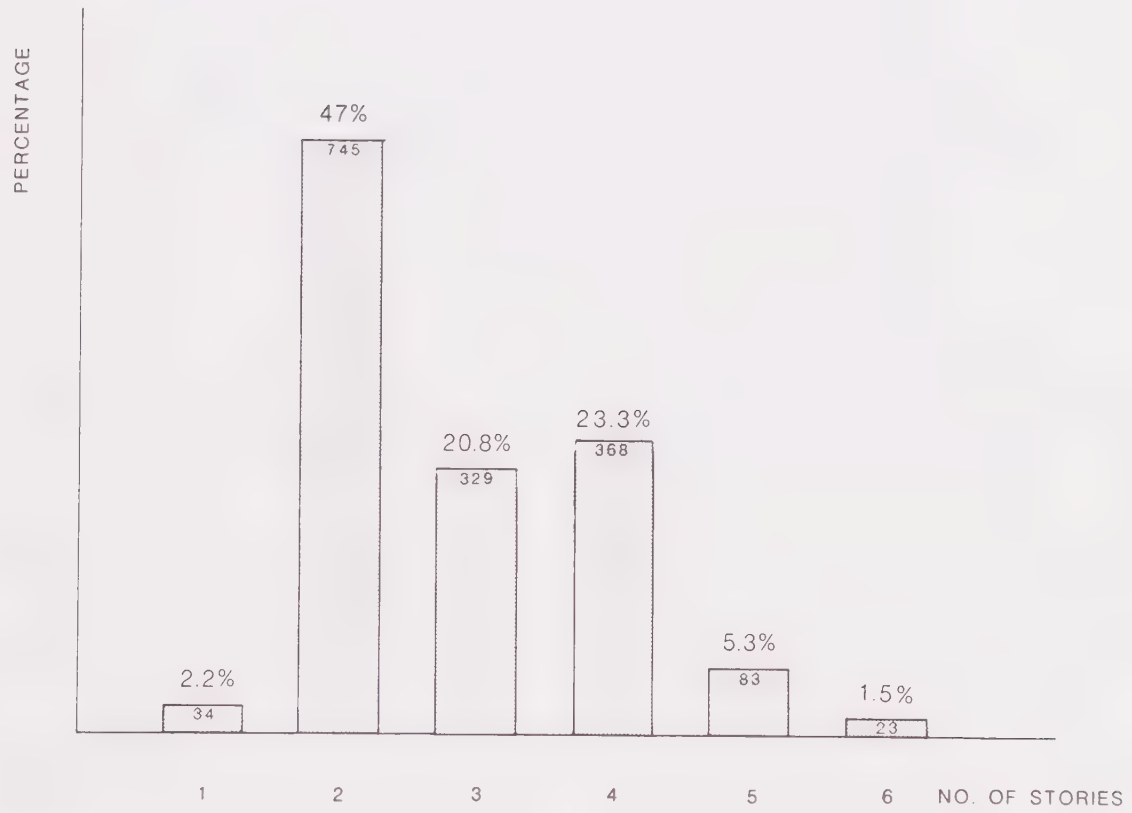
ground floor commercial spaces. Whereas, the 3 and 4 story buildings are primarily single-use residential buildings, which more easily qualify for city funding.

The configuration of a building can substantially affect its strengthening cost. Major irregularities cause differential movement between parts of the building and stress concentration at re-entrant (inside) corners. Strengthening of this building type may involve seismic cutting or large ties. The data from the hazardous building survey indicate that approximately 70% of the buildings are rectangular. The other 30% consist of "L" shaped, "U" shaped, "O" shaped and other irregular shapes. These will be referred herein jointly as irregular shapes. Table 3 further shows that a higher percentage of the single use buildings are irregular compared to the mixed-use group. This is in accord with the residential access requirements for light and ventilation which often necessitate irregularity in plan shape. In fact, the data shows that approximately 40% of the 3 & 4 story buildings are irregularly shaped. This percentage may be misleadingly high as most of the buildings cited as irregular in the survey are not sufficiently irregular in structure to yield substantially higher strengthening cost. For example, rectangular buildings with small protruding bays or light well inlets are often described as "T" or "L" shaped buildings. In structural terms, irregular configuration refers to buildings with long clear wings or large interior atriums. The researchers estimate that less than 20% of the 3 and 4 story residential buildings are structurally irregular.

The size of the building footprint also affects the upgrading cost as larger footprints generally require more lines of shear bracing (ie., shear walls or braced frames). More lines of shear elements generally yield higher costs as they often require new footings. Thus, the selection of prototype should reflect typical footprint size. Figure 4 is a distribution of footprint size, indicating that the 2,000 to 7,000 square foot range is the most common, covering about 70% of the buildings. Most of the 3 and 4 story buildings probably fall within this category, averaging 5-7,000 square feet.

FIGURE 1

DISTRIBUTION OF BUILDINGS BY HEIGHT

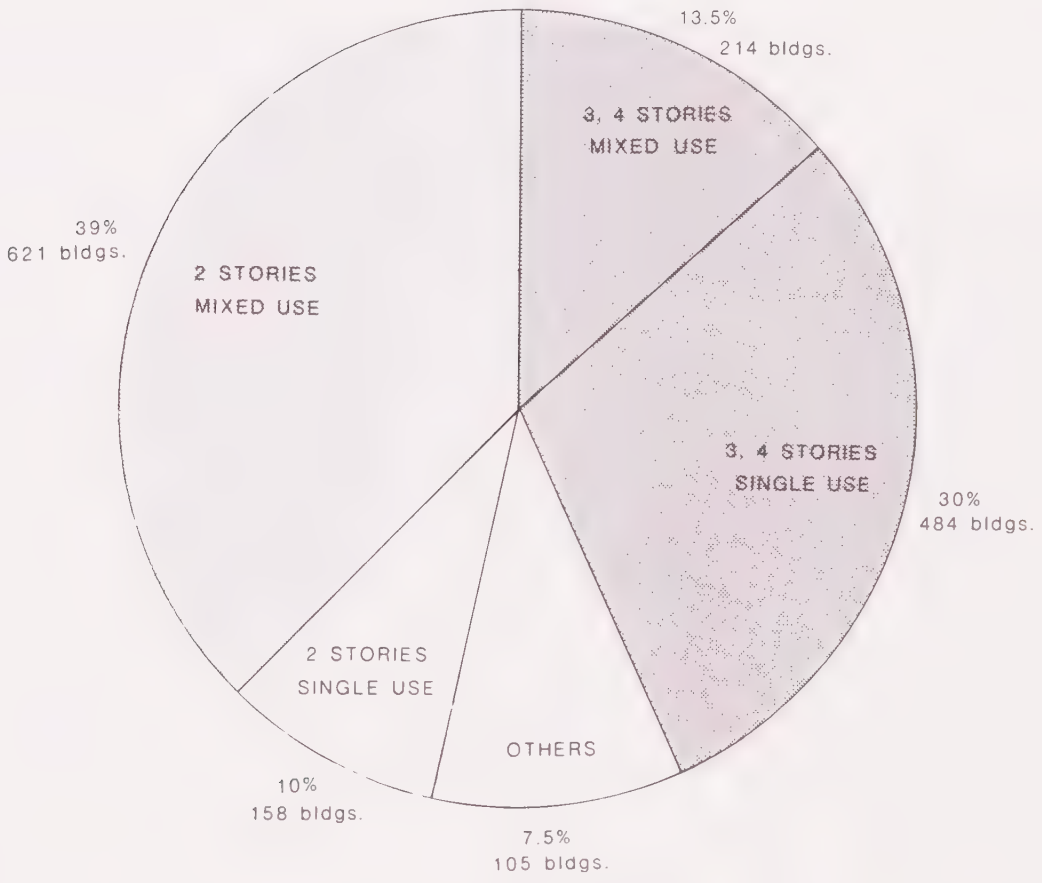


MOST URM'S ARE 2, 3 AND 4 STORIES.

Note: Percentages are based on the 1582 URM residential buildings in the Los Angeles Hazardous Building Survey.

FIGURE 2

DISTRIBUTION OF BUILDINGS BY USEAGE AND HEIGHT



MOST 2 STORY URM'S ARE MIXED USE, WHILE MOST 3 AND 4 STORY URM'S ARE SINGLE USE RESDENTIAL BUILDINGS.

Note: Percentages are based on the 1582 URM residential buildings in the Los Angeles Hazardous Building Survey.

TABLE 3

DISTRIBUTION OF BUILDINGS BY USAGE,
HEIGHT, & CONFIGURATION

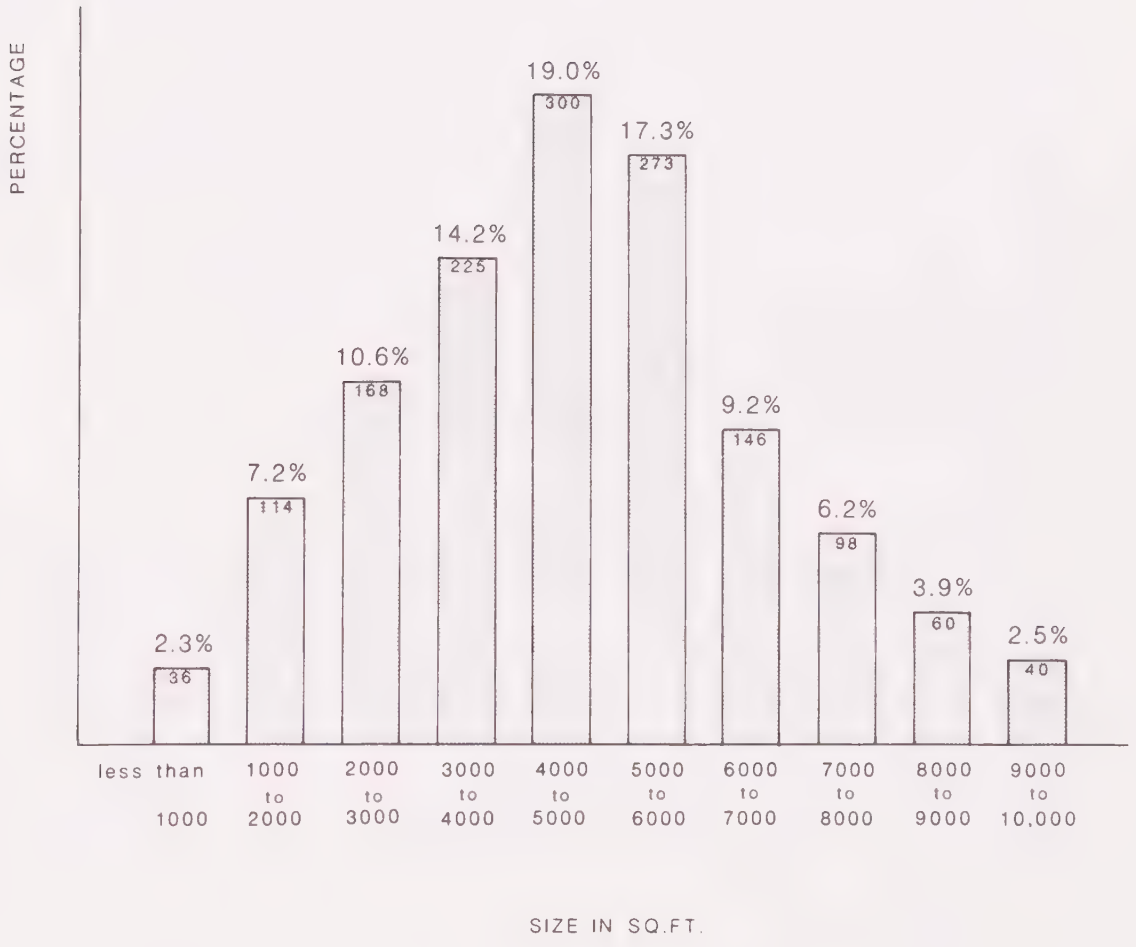
	2 STORIES		3 & 4 STORIES	
	RECT.	IRREG.	RECT.	IRREG.
SINGLE	6.5%	2.9%	18.7%	12.0%
MIXED	29.7%	8.0%	8.6%	4.9%
TOTAL	36.2%	10.9%	27.3%	16.9%

Higher percentage of single use 3 and 4 story buildings are surveyed as irregular compared to the other groups.

NOTE: Percentages are based on the 1582 URM residential buildings in the Los Angeles Hazardous Building Survey.

FIGURE 4

DISTRIBUTION OF BUILDINGS BY FOOTPRINT SIZE



Note: Percentages are based on the 1582 URM residential buildings in the Los Angeles Hazardous Building Survey. 7.6% of the buildings are in the 10,000 to 26,000 sq.ft. range. They are not shown in graph.

Preliminary Selection

As the primary objective of this survey is to assess the seismic cost associated with CDD assisted projects, the prototypes have been chosen from the group of buildings which have received or have been considered for CDD funding. Based on the December 1986, CDD list of 46 buildings, eleven prototypical case studies have been selected. It should be noted that this collection of building does not completely represent the entire hazardous unreinforced masonry residential building stock. As the statistical data shows, roughly half of the buildings are 2 story mixed-use and there are no buildings of this type funded by CDD. This survey is focused on the 3-4 story single-use residential building types.

From the base set of 46 buildings, a preliminary list of approximately 20 buildings were selected jointly by the Director of the Rent Stabilization Division and the research staff based on:

1) Typical original construction and retrofit method
2) Completion status of the project
3) Representative owner types
4) Representative project locations
5) Availability of project information

Confirmation of Typical Construction

The 20 preliminary case studies were checked in detail to confirm that they reflect typical original construction and viable retrofit schemes. Unique local construction practice has been assessed by the research staff through construction site visits and interviews with building contractors and building inspectors, to compare case studies with typical local construction.

Some typical construction characteristics and retrofit techniques are described below:

> Most of the residential URM's are rectangular buildings with their narrow face on the street (approx. 50' wide). Typically, they are set away from the property line such that they can have windows on all sides. They also tend to be prismatic, (without vertical steps) with double load corridors running longitudinally at the center. Concrete foundation walls are common under the masonry perimeter walls, as well as under interior load bearing walls which tend to be corridor walls. The floor diaphragms usually consist of 1" structural flooring and 3/4" finish

flooring. Straight and diagonal structural floors are both common, whereas, roof diaphragms almost always consist of straight sheathing. Wall thicknesses are typically 13" with 18" at the lower floors.

Some of the later buildings have concrete bond beams at every floor as a part of the original construction. One source says that this type of construction exists in about 30-35% of the URM stock. The beams are often used as lintels over window openings. They are not officially recognized as contributing to the structural integrity of URM's other than that they eliminate the need for chord strengthening.

Typical earthquake upgrading includes the installation of anchors and shear bolts at all floors, usually done in combination. The most common method of increasing shear capacity is the addition of plywood sheathing over existing partition walls although gunite methods are also used. For economic reasons, the majority of the retrofits involves this plywood system both under the standard Division 88 requirement and under the new RGA approach. Typical retrofits also include parapet strengthening and re-roofing to remove the excess weight of the accumulated roof layers. Strengthening usually does not necessitate out-of-plane braces. Also, diaphragm strengthening is only usual when the plywood method is not used.

Based on this information, the preliminary list of 20 case study projects was further refined. Unrepresentative samples were deleted. One such example is 5169 Hollywood[8] where the original construction has asbestos in the flooring. This unusual condition has led to very high strengthening cost due to the presence of the hazardous material. This project could not be used as a typical case study. The final selection was also based on the completeness of the financial and construction cost data as well as the availability of construction documents. The final list of CDD case studies is as follows:

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8. 5169 Hollywood suffered heavy damage during the October 1, 1987 earthquake, as it was under construction at the time. It has been torn down.

1	341 Gramercy
2	514 S. Union
3	608 Dunsmuir
4	112 S. Occidental
5	744 Catalina
6	3075 Harrington
7	3051 Leeward
8	1845 N.Gramercy
9	2016 W. Adams
10	2022 W. Adams
11	715 St. Andrews

Selection of Projects Financed with Other Funding

The researchers felt that it would be valuable to compare seismic upgrade costs on the buildings funded by CDD with those done with other public and/or private financing. We reviewed the range of residential work with the Earthquake Safety Division of the Department of Building and Safety. They, in turn, recommended projects by two contractors which they considered both experienced and well respected. C. William Carson is a building owner as well as a general contractor. American International Construction is a general contractor working for a variety of clients. We reviewed data on seven of their buildings and selected four for case studies, using the same criteria applied to the CDD funded buildings. The final list of these case studies is as follows:

12	401 S. Rampart[9]
13	236 S. Coronado[9]
14	512 S. Rampart[9]
15	Building B[10]

B. Method of Analysis

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9. These project received funding from the Community Redevelopment Agency, which does not require the contractor to pay prevailing wages. Further, they may have alternatives to relocation assistance, which reduces their overall cost.

10. American International Construction prefers not to identify the names and addresses of their clients.

Cost information has been extracted from the CDD file or from the private construction record and presented in synopsis form for each case study (See Appendix). These forms are prepared for easy comparison of the following information:

1. Department of Building and Safety permit valuation and actual project expenditure - This comparison is to clarify the discrepancies between the cost of seismic upgrade recognized by the Building and Safety Department versus that expended by Community Development.

2. Determination of seismic cost - The construction contract and change order amounts are broken down and separated where possible into seismic structural costs and seismic related architectural costs. Seismic architectural cost refers to the cost of demolition and refinishing as necessitated by the structural work to restore the building to the original level of architectural finish before the retrofit. This cost analysis is to assess the relationship between the cost and the variables associated with each project as well as to determine the approximate ratio of seismic structural cost to the total seismic cost, including both architectural and structural costs.

3. Determination of soft costs - The objective here is to find the approximate value of soft costs related to rehabilitation projects. Soft costs such as engineering fees and construction permit costs are often recorded as a part of the hard cost under the seismic subcontract or under general requirements. Other soft costs, such as legal fees and financing costs are usually only available through the owner's record and are not differentiated for seismic and general rehab. As such, the total soft cost can only be approximately determined. However, this data will be valuable since soft cost related to seismic strengthening largely has been recognized only as engineering fees, testing and permit costs, neglecting the financial soft costs.

4. Comparison of seismic versus total rehab cost - The total rehab cost includes the cost of other improvements in addition to earthquake strengthening. The objective of this comparison is to assess the scope of other rehabilitation work performed along with seismic upgrading. This comparison also indicates the minimum level of required improvements versus that of substantial renovation done for the economic advantage.[11]

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11. Clearly, rehabilitation other than seismic is sometimes required in order to 1) satisfy

To perform the above tasks, different sources of data were analyzed for each of the case study buildings. Each source generally contained a part of the necessary information. The primary sources are:

1. Structural/Architectural Construction Documents - These provide data for the original construction as well as the retrofit methods used. They indicate the detailed scope of strengthening, which usually accounts for unusually high or low costs.

2. CDD Project Records - The CDD project file usually contains a copy of the original construction contract which indicates the scope of seismic and other rehab work. This sometimes includes post-construction summaries which reflect the changes in costs incurred during construction such as change orders, documenting the final hard cost expenditure. The project records also contain a record of funding sources as well as some indication of soft costs such as interests, bond fees, legal fees, etc.

3. Interviews with CDD Division Managers - Although the above project file contains the necessary information, the location of this information is not easily accomplished. This task was aided by the managers in charge of the specific projects. They also explained the peculiarities of each project.

4. Interviews with Building Owners and Contractors - Interviews have been conducted for both city funded buildings and privately funded projects. This source provided insights to the nature of the private funding, the tenant relationship, construction wages and the uniqueness of the building. They also bring useful feedback and suggestions on how to improve this retrofit process.

5. Private Construction Records - For privately funded projects, the cost information as presented in the appendix are derived from post-construction records provided by the owner or the contractor.

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lending policies instituted by private lenders, 2) meet HUD requirements, and 3) address other identified code violations. Other rehabilitation is also done in conjunction with seismic work because it is less expensive to do the construction work at the same time, and can help obtain better market rents.

III. FACTORS INFLUENCING COST

A. Direct Cost Factors

Direct cost refers to those costs that can be quantified such as hard and soft costs as opposed to intangible costs such as delays and opportunity costs. The factors that affect the direct cost of retrofit can be grouped into three areas: 1) the original construction 2) the retrofit process 3) city funding requirements.

Original Construction

Amongst the most salient in this group are building heights, configuration, and building footprint size. Of these, probably the most critical to buildings under this survey is the building configuration. The effect of configuration on cost has been discussed in a previous section. The height has great impact on cost and, depending on the type of strengthening method, the cost can increase dramatically with added floors. However, the group of buildings in this survey have a narrow range of heights (3-4 stories) and the height factor does not play a major role. This is also true for footprint sizes, where very large or very small footprints relative to the building's overall size will generally result in higher costs, although the buildings surveyed also have a relatively narrow range of footprint sizes and this variable has a limited impact.

Other original construction characteristics can have a substantial effect on cost. However, since the buildings under study are relatively homogeneous, these factors have minor effects on the cost range. They are:

1. amount of penetration in exterior load-bearing walls - more penetration generally means more shear wall/bracing needs to be added.

2. presence of concrete bond beam - which may eliminate the need for chord strengthening.

3. nature of the diaphragm - diagonal sheathing requires more shear walls or diaphragm strengthening.

4. roof condition - some buildings have a gable roof in the facade which requires plywood to be added to create a continuous diaphragm with the exterior walls.

5. mortar condition - poor mortar condition and/or cracking requires repointing.

The single most essential factor which accounts for the greatest variation in rehabilitation cost is the presence of unusual conditions. This is exacerbated by the uncertain nature of retrofit work; the unusual condition is generally not discovered until construction has commenced. An example of this is the presence of asbestos paper between the finish and structural floor, a condition discussed earlier. The research staff has encountered two such buildings and is concerned that there may be many more. Further examples of unusual conditions is the absence of certain existing structural numbers assumed to be in place, such as double joists under partitions, or the presence of inadequate foundations for additional seismic load.

Retrofit Process:

Compared to the original construction factors, the retrofit variables have much greater impact. For this group, many factors exert strong influences. They are:

1. Quality of Engineering Design - An efficient scheme for retrofit can greatly reduce cost. An engineering solution that accounts for the uniqueness of the building, rather than taking a cookbook approach may require higher fees. However, the fee for a better design is usually offset by savings in construction costs.

2. Level of Safety - Related to quality engineering is the desire of a good engineer to design for a consistent level of safety rather than to perform code minimum tasks. This concern may result in a higher cost, although the safety benefits are likely to be greater.

3. Sensitivity to Architectural Work and Construction Process - The strengthening scheme can be less costly if it minimizes necessary architectural demolition and refinishing. The savings can be substantial if strengthening does not involve removal and replacement of major fixtures, appliances, cabinetry and mechanical services. The choice of a retrofit scheme should also consider the construction process and its effect on the existing interior finish. For example, a gunite

shear wall in the interior of a building will require extensive masking to control construction debris compared to a plywood system.

4. Level of Architectural Finish - The cost for seismic related achitectural work is dependent on the level of refinement to which the building is finished. For economical building finishes, walls can be patched after structural work whereas a higher cost building may require much more extensive replacement and repair to restore to the original finish condition.

5. Experience - The experience of the professionals and the contractors involved will generally reduce both the fees and the hard costs as they can produce quality work in less time. Since these projects have a high degree of uncertainty relative to the original construction, the knowledge that comes from experience is essential.

6. Tenant Occupancy - The presence of tenants during construction will require more work to ensure safety and to provide an acceptable level of cleanliness for the tenants. However, this cost may be justified because it will prevent loss of rental income during the construction period.

City Funding Requirements:

In order to receive city funding, several requirements must be satisfied in addition to the seismic requirements. Davis-Bacon prevailing wages and Dorothy Mae fire requirements[12] are two major factors which affect seismic and other rehabilitation cost. The Davis-Bacon regulations require that the wage paid for construction is at prevailing wages. This has great impact on upgrading costs since renovation is a labor intensive process. It has been argued that a prevailing wage will produce speedy and quality work. Many owners and contractors disagree with this disposition, claiming that quality and speed depends on experience of the worker rather than the rate of the wage.

The Dorothy Mae Ordinance requires sprinklers and fire egress equipment to be installed as a part of renovation. This typically runs about $40,000 per building in hard

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12. The Dorothy Mae ordinance applies to all buildings constructed before 1944, 3 stories or higher, and thus generally includes buildings to which the Earthquake Hazards Reduction Ordinance applies.

costs, and clearly increases the total expenditure on the project. Together, both of these requirements significantly increase the total cost for a seismic upgrade.

B. Indirect Cost Factors

The indirect cost refers to those costs difficult to measure as a result of strengthening, mainly the loss of income and opportunity costs. These costs are substantial and will largely determine the economic success of projects.

The primary factor which determines these indirect costs is construction time. Construction can be delayed for many reasons. One is the unknown conditions in the building, which often require design changes during construction. Design changes, in turn, require proper approval from the Building and Safety Department, which may take a prolonged period of time. Some owners expressed that delays could be avoided if coordination between plan checking and building inspection was better. Cases have been observed where designs originally approved by a plan checker were not approved during inspection. The research staff recognizes this may be due to the newness of the earthquake safety program and coordination will improve in time. Another owner expressed that approval time could be shortened if deputy inspectors were engaged. This option is in fact sanctioned by the Department of Building and Safety for checking the proper torque at which anchors and shear bolts are installed. However, deputy inspectors are seldom requested by owners for this task which is only a small part of the inspection process.

Delayed construction has various effects on a retrofit project. If reconstruction is done with tenants in place, prolonged construction is inconvenient for the tenants. Longer construction time increases the risk of tenant accidents and subsequent law suits. Tenants may also become dissatisfied and move. The vacant units will be difficult to rent during construction, resulting in a loss of rental income. With the building vacated during construction, construction can proceed at a much faster rate. However, if construction is delayed in the approval process, the loss of income is clearly significant. Occupied or not, a building with delayed construction will be subject to deterioration as it is exposed to the weather and other sources of degradation.

Another type of indirect cost is the financial constraint placed on the owners. This is mainly related to the structure of the financing agreement on CDD funded projects.

One owner explained that the city requires that the owner submit his commitment amount to an escrow account at the beginning of construction before the amount is actually used. The owner further explained that if the financial commitment could take another form, and if the commitment amount is allowed to collect interest, the indirect cost would be substantially reduced.

IV. ACTUAL COSTS FOR SEISMIC RETROFIT

A. Summary of Cost Data in 1987 dollars

The cost results of the eleven CDD funded buildings and four privately funded buildings are summarized in Tables 5 and 6. The data indicates that the approximate range of seismic upgrading cost for CDD buildings, neglecting unusual cases, is from $7 to $12 per square foot, or $4,000 to $7,000 per unit. Case studies #5 and #10 are atypical with apparently much lower seismic cost. Case study #5 (744 Catalina) utilizes a retrofit scheme where some of the shear resisting elements are added as new partitions. However, the cost of the new partitions are not included as a part of the seismic cost in the original project record. If a part of this is attributed to seismic work, it would drive seismic cost approximately $2 per square foot higher, falling within the range of typical values. Case study #10 (2022 W. Adams) is a five story URM that is constructed later than typical. The lower cost per square foot here, may be due to the greater floor area or the higher strength of existing materials.

The results also indicate that the total cost of rehabilitation is much higher than the seismic upgrade cost for CDD funded buildings. The range is from $12 to $45 per square foot or $10,000 to $20,000 per unit. The lower end of this range represents buildings with minimal improvement aside from seismic rehabilitation, whereas the higher end represents a "gut" rehab.

Some architectural work is realistically a part of seismic cost. These costs are associated with the demolition and repair of finishes as a result of the structural work. This survey has adopted a consistant set of criteria to attribute architectural costs to seismic strengthening. The seismic architectural cost includes: re-roofing, plaster patching for seismic work, a portion of painting cost, a portion of replacement cost for floor covering, but excludes cost for electrical, plumbing and cabinetry work. A more detailed description of the criteria is included in the appendix. It should also be pointed out here that the seismic costs listed in project records tend to be a lump sum figure including all seismic structural work and necessary professional and permit fees. This format is probably adopted to accept bids from seismic subcontractors. However, the nature of the records does not allow further quantitative analysis of the seismic cost breakdown.

Table 7 presents the relations between structural and architectural costs attributed to the seismic work. The data shows that the structural cost is fairly consistant,

ranging from $6 to $8 per square foot. The seismic architectural costs have bigger variation, from $2 to $4 per square foot. This is probably due to two factors: The first is the variation in the level of architectural finish, and the second is the fact that similiar structural schemes can cause different amounts of necessary architectural demolition and repair work. For example, anchor bolts installed at floor levels of bathrooms and kitchens necessitate the moving of fixtures and demolition of tile finishes, whereas the same system can be installed at the ceiling level with much less seismic architectural cost. If an average is taken, the architectural cost is approximately 40% of the structural cost, or 30% of the total seismic cost.

The researchers recognize that the seismic cost presented here is slightly lower than actual costs due to the nature of the project data. It has been described previously that the seismic lump sum cost in the record includes professional and permit fees. However, this amount does not include soft cost associated with the financing of construction. Typically this cost can run 20 - 30% of the total hard cost. Incomplete records on actual soft costs should be accounted for in the interpretation of our presentation of cost data. Actual seismic cost to the owner may be somewhat higher. Although we have suggested 20-30%, it should be emphasized that the actual soft cost is a difficult figure to project. It will depend on the cost of financing during construction (if any), the cost of relocation (if any), the number of units vacant during construction (if any), and a host of other factors.

The researchers also recognize that the cost data is only representative of half the URM residential buildings. The statistics reveal that 44% of all residential buildings are 3 - 4 stories. The case studies are representative of this group since this is the type of project being funded by CDD. Two story buildings and buildings with commercial uses (47% of the residential stock) are by-and-large renovated with private or other funding sources. It is interesting to note, however, one particular 4 story commerical building we reviewed cost $6.30 per square foot for seismic work, which is comparable to the upgrading cost of residential buildings. Within our sample group, the number of stories, three or four, does not seem to affect the cost. The case study data of the few irregular buildings shows that the cost is also not substantially affected by shape. However, this fact must be qualified in that most of the buildings classified as irregular are not substantially irregular in structure to result in higher upgrading costs.

Costs of significantly irregular buildings, such as "L", "U", or "E" shaped structures, have not been determined for CDD funded buildings since these case study projects (5169 Hollywood and 6500 Yucca) are still under construction and final cost data is not yet available. One privately funded 2 story "U" shaped building has been reviewed by the research staff. The seismic structural cost for this particular building is approximately $11.50 per square foot, roughly twice as much as the average cost for rectangular buildings. In another privately funded case, a 6 story "U" shaped building, with a commercial ground floor and residential units above, has been strengthened under the RGA approach for approximately $6.30 per square foot. The cost per square foot of buildings with more stories and/or larger floor areas tend to be less because many items (such as foundation costs) are being distributed over a larger total building area. Because of its large floor area (68,000 sq. ft.) and the excellent existing structural condition, the per-square-foot cost of this 6 story case is likely to be lower than what would be typical for other irregular 3 and 4 story buildings. The researchers believe that a substantially higher cost range, at or above $10[13] per sq. ft., is indicative of retrofit schemes for these irregular buildings, although the percentage of this building type is small.

Cost reduction under the new RGA approach[14] is a consideration. While several building officials feel that the cost reduction under RGA would be substantial, the two private builders we interviewed for this study stated that in their experience, the cost savings have been approximately 15%. The RGA method generally requires less diaphragm strengthening as well as fewer additional shear braces. The anchorage and shear bolt systems can usually be performed without the removal of the structural floor using this approach. The cost reduction affects mainly the seismic architectural costs, as is evident in case study #15 where the seismic architectural cost is minimal.

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13. It is difficult to estimate precise costs because of the combined effect of the footprint size, height, and shape.

14. "RGA" was adopted by Building and Safety in 1987 as an alternative method of design for the structural upgrading of buildings which fall within the scope of Division 88. Essentially the RGA method allows greater strengths for existing materials and requires less demolition of existing interior walls.

B. Building and Safety Prodedures

The Department of Building and Safety's primary role in seismic retrofit is to ensure that the requirements of the ordinance are being fulfilled. They do not regulate the design as long as it satisfies the code. In this manner, they welcome overly conservative design and do not comment on the appropriateness of the proposed schemes. As a secondary objective, the Department collects a permit fee to support the regulatory agency. This is established by a percentage the project valuation submitted by the owner previous to the construction. This value is checked by the department so as to not fall below $6 per square foot, a rough average for seismic work. The building valuation as recorded by the department then is not necessarily the actual value as this value is submitted before construction and owners tend to not report the full value. In fact, the actual recorded value is much higher than the permit valuation for most cases. Table 8 compares permit valuation, actual expenditure, and amount of total funding for each case study project. It is pointed out here that neither permit valuation nor total project funding should be used to represent seismic or total renovation cost.

C. Comparison with Buildings Funded Under Other Sources:

As a group, the CDD buildings generally have a higher cost compared to similiar projects renovated with other sources of funding. The average seismic cost is approximately $9.50 for CDD building compared to average of $7.50 for Community Redevelopment Agency funded buildings (case study #12, #13, #14). In addition to the lower average cost, the Carson buildings entail much more strengthening work. These buildings utilize the concrete shear wall system, which has been generally recognized as a more costly method. One of the building, case study #14, also has settlement problems which resulted in a higher cost for strengthening. Even with the additional work, the average cost of these buildings is less than those of the CDD funded buildings.

The higher cost of CDD buildings can be attributed to two major requirements: 1) All buildings receiving city funding must comply to the Dorthy Mae ordinance, which usually involves approximately $1.50 per square foot worth of fire safety work. 2) All construction must also be done under federal regulations requiring Davis-Bacon prevailing wages. It is assumed that higher wages will result in higher quality work and shorter construction time. However, most owners and contractors contend that it is the worker's

experience with seismic work rather than the wage which makes the difference, and that the prevailing wage requirement increases the cost approximately 30%.

The Carson buildings, funded by the Community Redevelopement Agency, were required to comply with the Dorthy Mae Ordinance but not the Davis-Bacon wage requirement. The total rehab cost of these buildings, therefore is probably slightly higher than privately funded buildings while the seismic cost should be the similiar. The researchers estimate the seismic cost range for privately funded buildings to be near $5 per square foot, when plywood systems are used.

This estimated value seems to be confirmed by the data on total seismic rehabilitation cost as surveyed by Englekirk and Hart.[15] From the URM case studies recorded by Englekirk & Hart, a private construction company has strengthened eight residential buildings with heights of 2, 3, and 4 stories using the standard Division 88 approach. Their average total cost is $5.10 per square foot. The cost distribution of these eight buildings are recorded on Table 9. Although the funding sources of these buildings are not recorded, it can be assumed that they are not funded by CDD, as their total cost is well below those of CDD funded projects.

Whereas the higher seismic cost of the CDD funded building can be attributed to the higher wages, the higher total rehab cost of the CDD funded buildings seems to be unreasonably high. On the whole, the CDD buildings are spending much more on refurbishing than the other groups. The average percentage of seismic cost to total rehab cost for CDD buildings is 43%, where it is 80% for the Carson buildings. The privately funded buildings, including the four American International buildings and eight surveyed by Englekirk & Hart, are essentially 100% seismic rehabilitation without any other improvements.[16] With the Dorthy Mae requirement in effect, the minimal improvement project should have around 80% seismic work. This is essentially the scenario for Carson's buildings as well as case study #1.

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15. This data is from a Federal Emergency Management Agency funded research project recently completed by Englekirk & Hart, Consulting Engineers of Los Angeles, 1987.

16. Because the notices to comply with the Dorothy Mae Ordinance were issued in August of 1984, many building owners may have applied for and completed the fire safety work separately.

TABLE 5

SEISMIC COST AND TOTAL COST OF REHABILITATION FOR CASE STUDY BUILDING

Case No.	Address	Floor Area	No. of Units	No. of Stories	Total Seismic	Total Rehab.	Seismic per Sq. Ft.	Total per Sq. Ft.	Seismic per Unit	Total per Unit
1	341 S. Gramercy	14,769	12	3	$143,928	$175,027	$9.75	$11.85	$ 11,994	$14,585
2	514 S. Union	24,100	47	4	183,744	609,617	7.62	25.30	3,909	12,970
3	608 S. Dunsmuir	24,280	32	4	217,894	334,347	8.97	13.77	6,809	10,448
4	112 S. Occidental	14,600	27	3	117,558	564,279	8.05	38.64	4,354	20,899
5	744 Catalina	21,500	40	4	138,620	761,294	6.45	35.41	3,466	19,032
6	3075 Harrington	11,500	18	3	128,606	232,809	11.18	20.24	7,145	12,934
7	3051 Leeward	21,000	47	4	247,983	969,763	11.80	46.18	5,276	20,633
8	1845 N. Gramercy	23,500	48	4	272,121	502,561	11.58	21.39	5,669	10,470
9	2016 W. Adams	26,622	35	4	249,904	427,935	9.39	16.07	7,140	12,227
10	2022 W. Adams	31,670	38	5	198,477	523,000	6.26	16.51	5,223	13,763
11	715 S. St.Andrews	21,340	44	4	280,572	460,339	13.15	21.57	6,377	10,462
				average for CDD funded buildings			9.47	24.27	6,124	14,402
12	401 S. Rampart	21,300	45	3	185,855	229,749	8.73	10.78	4,425	5,470
13	236 S. Coronado	32,000	40	3	158,530	213,875	4.95	6.68	3,963	5,347
14	512 S. Rampart	17,500	26	4	157,345	190,296	8.99	10.87	6,052	7,319
				average for Carson buildings			7.55	9.44	4,813	6,045
15	Building B	17,400	30	3	87,960	87,960	5.05	5.05	2,932	2,932

TABLE 6

SEISMIC COST AS A PERCENTAGE OF TOTAL REHAB COST

CASE NO.	TOTAL REHAB COST ($)	TOTAL SEISMIC COST($)	SEISMIC PERCENTAGE
1	175,027	143,928	82%
2	609,617	183,744	30%
3	334,347	217,894	65%
4	564,279	117,558	21%
5	761,294	138,620	18%
6	232,809	128,606	55%
7	969,763	247,983	26%
8	502,561	272,121	54%
9	427,935	249,904	58%
10	523,000	198,477	38%
11	460,339	280,572	61%
	AVERAGE FOR CDD FUNDED BUILDINGS		43%
12	229,749	185,855	81%
13	213,875	158,530	74%
14	190,296	157,345	83%
	AVERAGE FOR CARSON BUILDINGS		80%
15	87,960	87,960	100%

TABLE 7

BREAKDOWN OF SEISMIC STRUCTURAL & SEISMIC ARCHITECTURAL COSTS

Case No.	Seismic Structural Per Sq. Ft.	Seismic Architectural Per Sq. Ft.	Total Seismic per Sq. Ft.	Arch Cost as a % of Structural Cost	Arch Cost as a % of Total Seismic
1	-----	-----[17]	$ 9.75	-----	-----
2	-----	-----#	7.62	-----	-----
3	6.83	2.14	8.97	31%	24%
4	6.00	2.05	8.05	34%	25%
5	-----	-----#	6.45	-----	-----
6	-----	-----#	11.18	-----	-----
7	8.25	3.56	11.80	43%	-----
8	8.35	3.22	11.58	39%	30%
9	6.70	2.68	9.39	40%	28%
10	4.01	2.25[18]	6.26	56%	29%
11	8.37	4.77	13.15	57%	36%
12	6.48	2.25	8.73	35%	26%
13	3.75	1.20	4.95	32%	24%
14	5.89	3.10	8.99	53%	34%
15	4.83	0.23	5.05	5%[19]	5%

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17. Seismic structural costs and seismic architectural costs cannot be separated in these buildings due to the nature of the records.

18. This building is unusual in its original construction compared to other case studies.

19. The low architectural cost is due to the RGA method of strengthening adopted in 1987 by the Department of Building and Safety, this upgrading method involves less demolition than the original Division 88 requirements.

TABLE 8

COMPARISON OF PERMIT VALUATION & EXPENDITURE

Case Study No.	Total Seismic Cost	Total Project Expenditure	Total Rehab Permit Valuation	Total Project Funding
1	$143,928	$175,027	$170,000	$185,725
2	183,744	609,617	168,000	650,000
3	217,894	334,347	180,000	366,510
4	117,558	564,279	236,000	406,000
5	138,620	761,294	462,000	775,000
6	128,606	232,809	181,000	250,826
7	247,983	969,763	uncertain	783,863
8	272,121	502,561	160,000	548,597
9	249,904	427,935	55,000	411,000
10	198,477	523,000	70,000	523,000
11	280,572	460,339	60,000	472,132
12	185,855	229,749	178,000	230,000
13	158,530	213,875	200,000	219,000
14	157,345	190,296	184,000	uncertain
15	87,960	87,960	uncertain	uncertain

TABLE 9

STATISTICS OF URM SEISMIC REHABILITATION COSTS FROM PRIVATE BUILDERS

BUILDINGS: USE AND HEIGHT		NUMBER OF BUILDINGS / RANGE OF COST PER SQ.FT. ($)										AV. COST	AVERAGE FOOTPRINT SIZE
		TO 4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20...		
RESIDENTIAL COMBINED WITH COMMERCIAL	2 STORIES	1	3	5	1							$6.29	6,869 sf
	3 STORIES						1	1				$12.97	8,820 sf
RESIDENTIAL	2 STORIES			1								$6.10	3,280 sf
	3 STORIES		2									$4.54	5,346 sf
	4 STORIES	1	3	1								$5.17	6,673 sf
	5 STORIES		1									$4.55	4,612 sf
COMMERCIAL	1 STORY	5	8	10	6	6	1	1	2	1	2	$8.94	8,206 sf
	2 STORIES	3	6	5		1						$5.46	9,744 sf
	3 STORIES	1	4	2								$4.69	7,861 sf

Source Englekirk & Hart, Consulting Engineers, Los Angeles, 1987

V. IMPLICATIONS FOR AFFORDABLE HOUSING

A. The Number and Location of Unreinforced Masonry Residential Buildings in Los Angeles

Of the 485,000 rent regulated housing units in Los Angeles, approximately 46,355 are located in unreinforced masonry apartment and hotel buildings.

The number of residential URM buildings, based on the BBI survey is:

Apartment - 1,317 bldgs.
Hotel - 245 bldgs.
Total - 1,562 bldgs.[20]

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20. Because there are continuous changes to the BBI List of Buildings (due to exemptions, errors, demolitions, etc.) the actual building count does vary. The July 1987 computer run used in Chapter II showed 1582 buildings; whereas the July 1988 run used in this Chapter puts the total at 1562.

The following table excerpted from a December 1985 Rent Stabilization Division Memo further exemplifies the changing nature of the list.

RESIDENTIAL BUILDING NOT MEETING SEISMIC CODES
COUNCIL DISTRICT DISTRIBUTION

COUNCIL DISTRICT	HOTELS	APARTMENTS	TOTAL RESIDENTIAL
1	0	3	3
2	1	10	11
3	0	0	0
4	16	400	416
5	4	42	46
6	5	69	74
7	1	1	2
8	2	64	66
9	193	247	440
10	14	252	266
11	1	11	12
12	0	0	0
13	20	184	204
14	11	103	114
15	14	22	36
DECEMBER 1985 TOTAL:	282	1,408	1,690
KNOWN TO BE DEMOLISHED:			120
EXEMPTED:			+/- 8
OCTOBER 1988 TOTAL:	245	1,313	1,562

Exact unit counts are somewhat difficult because only some of the buildings in the BBI survey have unit data. The survey lists:

Apartment - 29,980 units
Hotel - 14,533 units
Total - 44,513 units

However, a unit count is unknown for 30 apartment buildings and 18 hotel buildings. Therefore, the above unit count accounts for only 1,287 (1,317 - 30) apartment buildings and 227 (245 - 18) hotel buildings. To account for all the buildings (1,562) we have used the following estimates:

$$\text{Average unit/apt. bldg.} = \frac{29,980}{1,287} = 23 \text{ units/bldg.}$$

$$\text{Average unit/hotel bldg.} = \frac{14,533}{227} = 64 \text{ units/bldg.}$$

Total apt. units = 29,980 + 30 x 23 = 30,670 units

Total hotel units = 14,533 + 18 x 64 = 15,685 units

Approximate total units = 46,355 units

Most of these buildings are located in four of the 13 Los Angeles Community Areas as defined by Hamilton Rabinovitz and Alschuler in the 1988 Rent Stabilization Review (see Table 10).[21] 89% of all the residential buildings cited are located in: Area 7, Hollywood, Silver Lake and Echo Park; Area 8, North East Los Angeles; Area 9, Wilshire and Westlake; and Area 11, South Central Los Angeles. (See Table 10.)

These "downtown" areas house populations which are primarily low income, elderly and Hispanic (and/or other minority populations). Demographic data collected in the 1987 Tenant Survey on Rent Stabilized Units supports this generalization (see Tables 11-14) as does a 1983/84 discussion paper prepared by the Community Redevelopment Agency (CRA) in preparation for their Rehabilitation Funding Program.

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21. It should be pointed out that the 13 Community Areas are aggregations of the 35 Community Planning Areas which are the geographic subdivisions specified in the City's General Plan.

In that report the CRA described a project circle with a three mile radius from the center of Bunker Hill (see Figure 15). Based on their count, approximately 700 buildings (with 29,400 units) were located in that 6 mile diameter circle. The report describes these units as follows:

These units consist of:

TYPE	NUMBER	PERCENTAGE	AVERAGE RENT
SRO	2,352	8	$167
0-BR.	20,505	70	231
1-BR.	6,468	22	286
2-BR.	75	0 (rounded)	(unknown)

The tenant income is particularly low. A recent survey indicated that an overwhelming number of residents are very low income. The results revealed that:

$ SALARY/YEAR	NUMBER	PERCENTAGE
5,000/10,000	21,765	74
10,000/13,600	5,880	20
13,600/21,750	1,470	5
21,750/27,200	285	1

Assuming these figures are correct, nearly all tenants would be paying over 30% of their total income for housing. In fact, in a survey conducted by CDD ten (10) buildings reported the rent, as a percentage of income, averaged 32.7% with a low of 25% and a high of 42% before rehabilitation.

B. Neighborhood Conditions

Within Area 7, the Hollywood, Silver Lake and Echo Park districts, tenants have been in-place an average of five years. 54% are white, 31% are Hispanic, 20% are elderly and 66% have incomes less than $30,000.

Within Area 8, Northeast Los Angeles (the "near" downtown and Boyle Heights), the tenants' average tenure is 5.4 years and 40% of the units are overcrowded by Federal standards of more than one person per room. 71% of the population is Hispanic, 45% have incomes less than $20,000 and 78% have incomes less than $30,000.

Within Area 9, the Wilshire and Westlake districts, the average tenure is 6.3 years. 50% of the population is white, 20% Hispanic, and 17% Black. 20% are elderly, 43% have incomes less than $20,000 and 65% have incomes less than $30,000.

Within Area 11, South Central Los Angeles, the average tenant tenure is 4.16 years with 30% of the units classified as overcrowded. 40% of the population is Hispanic and 45% is Black. 11% of the population is elderly, 20% have incomes less than $10,000, 60% have incomes less than $20,000, and 85% have incomes less than $30,000.

According to the 1988 Rent Stabilization Review, the Labor Market Planning Area #3, which combines Community Areas 7 and 9, has the City's largest number of rent stabilized housing units (36% of the total stabilized stock). The tenants in these units are primarily white, single and elderly. Their incomes are low to moderate (with two-thirds under $30,000 per year) and 51% have lived in the same unit for at least 9 years.[22]

In all four of these areas, tenants pay significantly less rent ($399 to $483 per month) than other areas of the city and they represent the great majority of the City's poor, minority, and elderly populations. Nevertheless, these low income tenants pay a much higher percentage of their incomes on rent. While the city-wide rent-to-income ratio stayed roughly the same between 1977 and 1988 for households with incomes of $20-40,000, rent stabilized households which earned less than $10,000 in 1987 paid an average of 58% of their monetary income on rent. Households with incomes of $10-20,000 paid 39%, compared to the average of 29%. Fur-

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22. 1988 Rent Stabilization Review, Community Development Department, City of Los Angeles, pp. 158-160.

ther, the average increase in the rent to income ratio was primarily centered in Hispanic, Asian and other minority households.[23] Given the statistics on age ethnicity and income, Community Areas 7,8,9 and 11 experience the highest rent-to-income ratios. Anything which causes this ratio to rise (e.g. rent increases resulting from seismic rehab) at best diverts a very limited income from other essential services, and at worst displaces these households.

Table 10

Percentage of URM Residential and Hotel Buildings in 4 of 13 Community Planning Areas

Planning Area	Number of Apt. Bldgs. Cited	% of Apt. Bldgs. Cited	Number of Hotel Bldgs. Cited	% of Hotel Bldgs. Cited	Combined Apts. & Hotels	% Tot. Bldgs. Cited
7	247	19	16	6	263	17
8	162	12	157	64	319	21
9	512	39	39	16	551	35
11	243	19	12	5	255	16
Other	149	11	21	9	170	11
Total	1313	100	245	100	1558	100

Source: Department of Building and Safety, Earthquake Safety Division, Earthquake File, 7/14/88; and Hamilton Rabinovitz & Altschuler, Inc., Demographic and Housing Statistics for Rent Stabilized Units, 1988.

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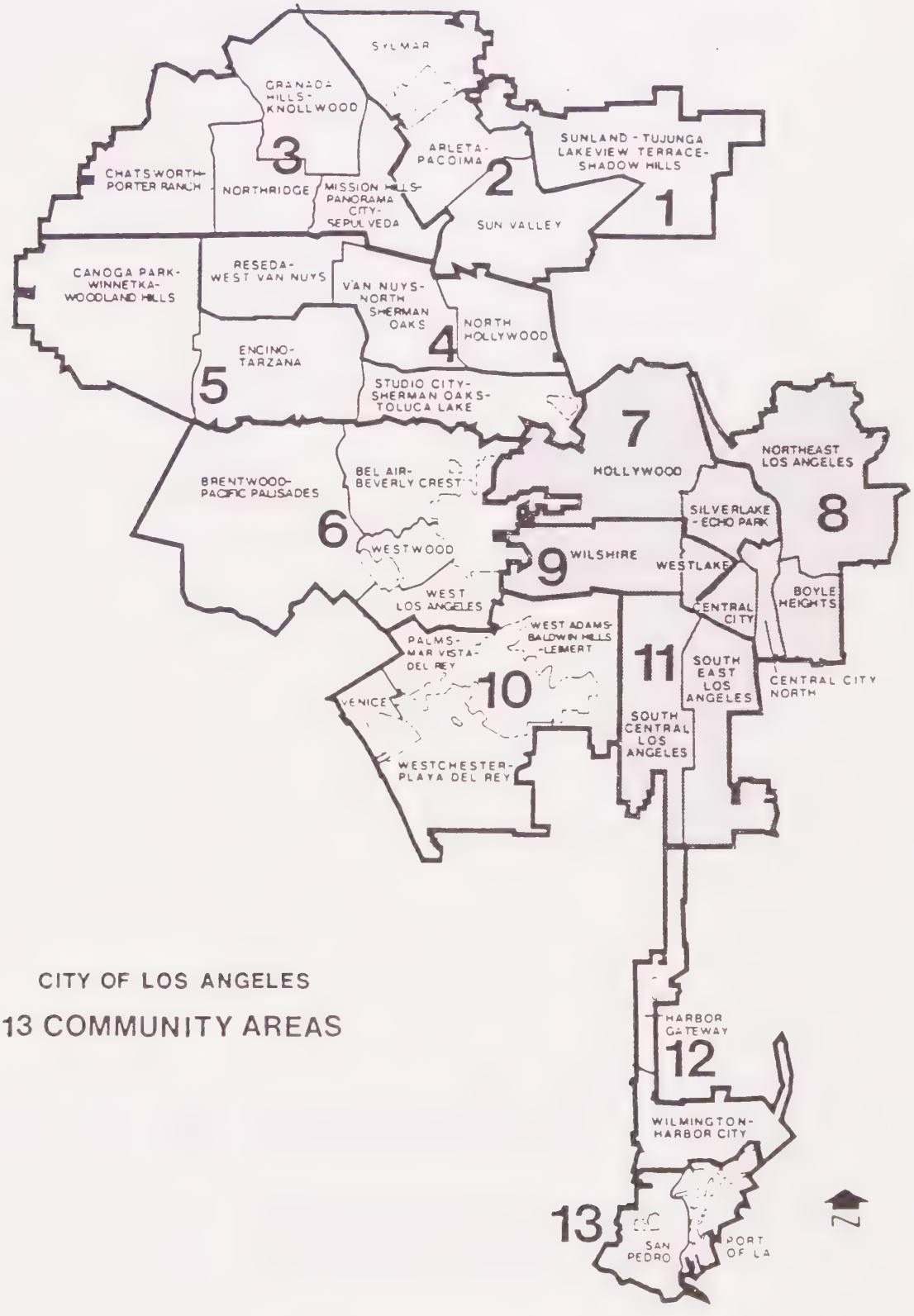
23. Ibid, pp. 126-134.



CITY OF LOS ANGELES

13 COMMUNITY AREAS

Table 11

Number of Observations and Mean Value of Several Variables by Community Area

Area Area Area	Area #7	#8	#9	#11
Household tenure measured in years	4.92	5.45	6.32	4.16
Persons per room	.91	1.18	.82	1.16
Proportion of units with more than one person per room	.23	.40	.15	.31
Household income	24547.17	21266.05	26511.11	19776.12
Age of head of household	44.21	38.79	44.70	38.80
Household size	2.37	3.59	2.13	3.31
Contract rent	476.38	399.94	483.59	399.28
Gross Rent	504.19	434.84	506.60	444.48
Gross rent-to-income ration	.29	.28	.29	.31
Proportion of units with incomplete plumbing	.02	.02	.01	.02
Proportion of units with inadequate heating	.06	.10	.06	.10
Proportion of units with 3 or more tenant reported defects	.09	.13	.08	.13

Source: Tables 10,11, 12, 13 and 14, Hamilton, Rabinovitz & Alschuler, Inc., Demographic and Housing Statistics for Rent Stabilized Units, 1988.

STATA by: Computing Resource Center
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Los Angeles, California 90064

Table 12

Income Distribution by Community Area

CATEGORIES	7	8	9	11	Total
$0-10	20	12	10	14	109
	12.58	11.01	11.11	20.90	11.08
$10-20	44	38	29	26	271
	27.67	34.86	32.22	38.81	27.54
$20-30	41	35	20	17	246
	25.79	32.11	22.22	25.37	25.00
$30-40	25	15	18	1	167
	15.72	13.76	20.00	1.49	16.97
$40+	29	9	13	9	191
	18.24	8.26	14.44	13.43	19.41
Total	159	109	90	67	984
	100.00	100.00	100.00	100.00	100.00

Source: Tables 10,11, 12, 13 and 14, Hamilton, Rabinovitz & Alschuler, Inc., Demographic and Housing Statistics for Rent Stabilized Units, 1988.

STATA by: Computing Resource Center
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Los Angeles, California 90064

Table 13

Race of Household Head by Community Area

HOUSEHOLD HEAD	7	8	9	11	Total
White	115	23	63	8	687
	54.25	14.20	49.61	7.92	49.64
Black	8	9	21	46	148
	3.77	5.56	16.54	45.54	10.69
Hispanic	67	116	26	41	435
	31.60	71.60	20.47	40.59	31.43
Other	22	14	17	6	114
	10.38	8.64	13.39	5.94	8.24
Total	212	162	127	101	1385
	100.00	100.00	100.00	100.00	100.00

Source: Tables 10,11, 12, 13 and 14, Hamilton, Rabinovitz & Alschuler, Inc., Demographic and Housing Statistics for Rent Stabilized Units, 1988.

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Table 14

Age of Household Head by Community Area

HOUSEHOLD HEAD	7	8	9	11	Total
< 30	32	37	21	22	290
	18.08	25.34	21.88	25.29	24.94
30-62	109	99	55	55	704
	61.58	67.81	57.29	63.22	60.53
62+	36	10	20	10	169
	20.34	6.85	20.83	11.49	14.53
Total	177	146	96	87	1163
	100.00	100.00	100.00	100.00	100.00

Source: Tables 10,11, 12, 13 and 14, Hamilton, Rabinovitz & Alschuler, Inc., Demographic and Housing Statistics for Rent Stabilized Units, 1988.

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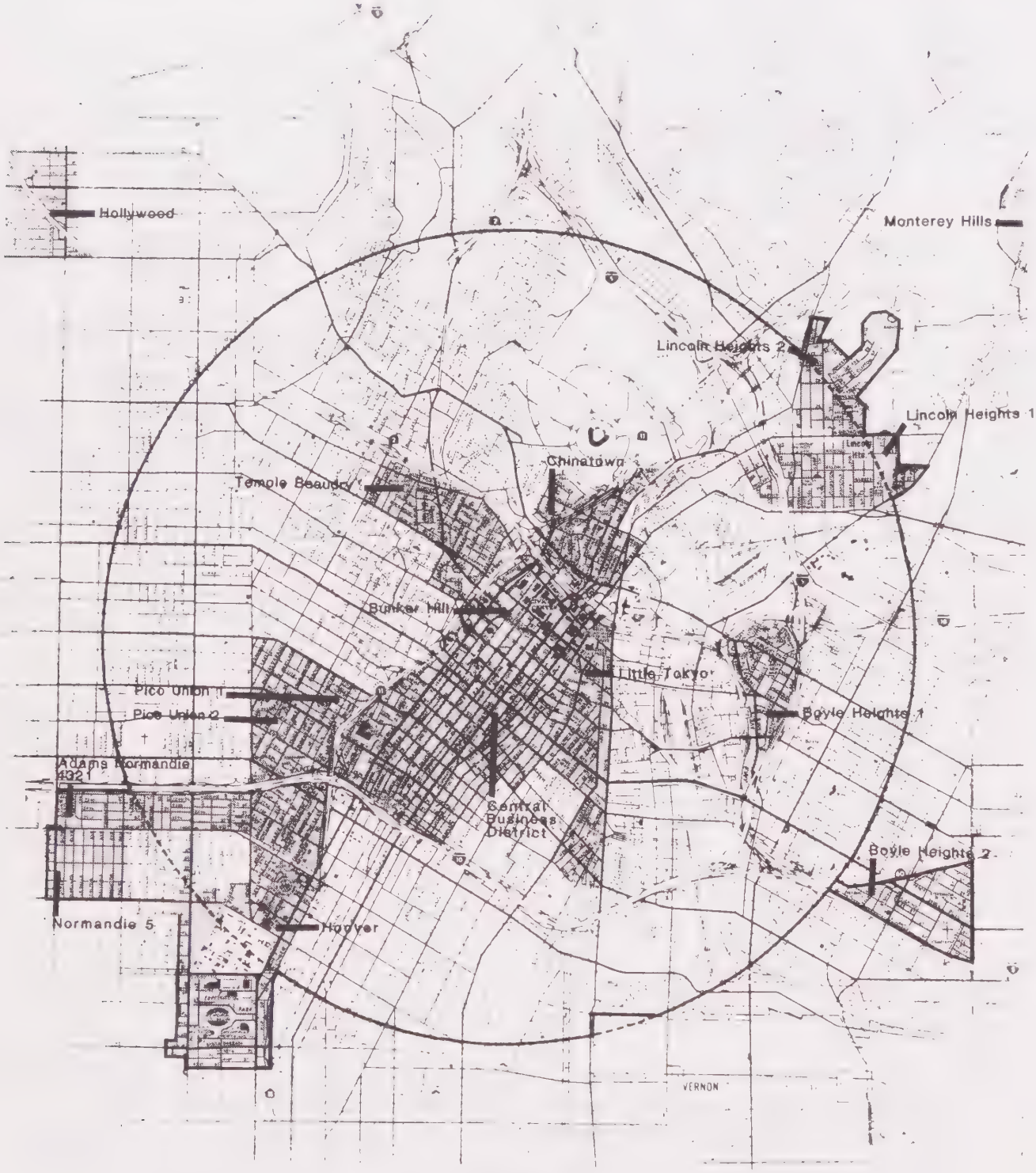


FIGURE 15

Source: Community Redevelopment Agency, Discussion Paper Seismic Safety Rehabilitation Program, 1983-84.

C. Compliance with the Ordinance

Because 89% of the apartment buildings and 91% of the residential hotels are located in Planning Areas 7, 8, 9 and 11; and because it is extremely doubtful that residents displaced from these units could find replacement housing of comparable rents; it is important to review the compliance-status of the seismically deficient buildings.

All residential buildings were cited by BBI, which means 1,317 apartments and 245 hotels. The number of buildings cited in each year were as follows:

Year	Apartments	Hotels
1981	9 (0.70%)	8 (3.54%)
1982	16 (1.25%)	20 (8.85%)
1983	15 (1.17%)	10 (4.42%)
1984	28 (2.19%)	5 (2.21%)
1985	49 (3.83%)	41 (18.14%)
1986	1,100 (86.07%)	139 (61.50%)
1987	61 (4.77%)	3 (1.33%)
	1,278	226

The greatest number of buildings were cited for both apartments and hotels in 1986.

The citation date for 39 apartments and 19 hotels were not known.

There are 3 stages of compliance:

1. 9 months to submit a plan after citation
2. 1 year to secure a permit
3. 6 months to start the work

and, the work must be completed within 3 years from citation date.

Before July, 1985, there was a much longer time (about 6 years in total) to comply with the citation. However, after a moratorium went into effect at that time, even those cited before July, 1985 had to comply with the above terms.

Since the majority of buildings (95%) were cited by September of 1986, we would expect that all those intending to comply with the ordinance would have submitted plans and secured a building permit in the ensuing 2 years.

To meet the compliance standards all plans should have been submitted by June of 1987, all permits should have been secured by June of 1988, and all construction work should have started by December of 1988.

1986 September	1987 June	1988 June	1988 December
9 months to submit plans	12 months to secure a permit	6 months to start work	

According to BBI Computer Records as of December 1988:

24% have completed construction,
59% are in process, but have not started construction,
8% have been demolished,
9% have not complied. (See Table 16)

Based on the current regulations, the time to comply with the ordinance has run out, and by law the city should notify those who have not complied to vacate their buildings. Using average unit counts, this represents 3700 housing units which have already been demolished and 4400 units which are in serious jeopardy. Further, it is not clear that all owners who have submitted plans will, in fact, complete the renovation in a timely fashion. In fact, the great majority of residential building owners have not yet started construction (see Tables 17-23).

Table 16

Building Compliance Status (as of December 17, 1988)

	Residential Total	Percent	Commercial Total	Percent
Buildings completed (F/C +Alt. I & II)	387	23%	1306	20%
Buildings Demolished	126	8%	784	12%
Buildings with Anchor only (Alt. II, Phase I)	23	1%	673	11%
Buildings Kept Vacant	0	0	85	1%
Buildings under Permit	696	42%	1771	28%
Buildings with Plans submitted	280	17%	1009	16%
Buildings without Plans	152	9%	780	12%
Number of Buildings on 1981 List	1664	100%	6408	100%
Buildings Deleted	- 82		- 60	
Current Buildings on List	1582		6348	

Source: Department of Building and Safety, Earthquake Safety Division, 1/6/89.

Table 17

Buildings and Units Not Yet Started Construction

Buildings		Units
Hotels:	170 (15%)	11,058 (35%)
Apts:	958 (85%)	20,118 (65%)
Total:	1128 (67%)	31,118 (67%)

Source: Department of Building and Safety, Earthquake Safety Division, 7/14/88.

Table 18

Properties Which Have Not Yet Started Construction

Apartments

Area	Started	Not Started Construction	Total
7	74	173 (70%)	247
8	43	119 (73%)	162
9	175	337 (66%)	512
11	34	209 (86%)	243
Other	29	120 (81%)	149
Total	355	958 (73%)	1313

Hotels

Area	Started	Not Started Construction	Total
7	4	12 (75%)	16
8	50	107 (68%)	157
9	11	28 (72%)	39
11	4	8 (66%)	12
Other	6	15 (71%)	21
Total	75	170 (69%)	245

Source: Department of Building and Safety, Earthquake Safety Division, 7/12/88.

Table 19

Number Of Properties Which Finished Construction Or Under Construction

Apartments

Area	Alt 1	Anchor 1	Anchor 2	Construction Completed (Total)	Construction In Progress	Total Bldgs.
7	48	6	1	55	19	247
8	18	6	1	25	18	162
9	123	9	1	133	42	512
11	18	9	0	27	7	243
Other	19	2	0	21	8	149
Total	226	32	3	261	94	1313

Hotels

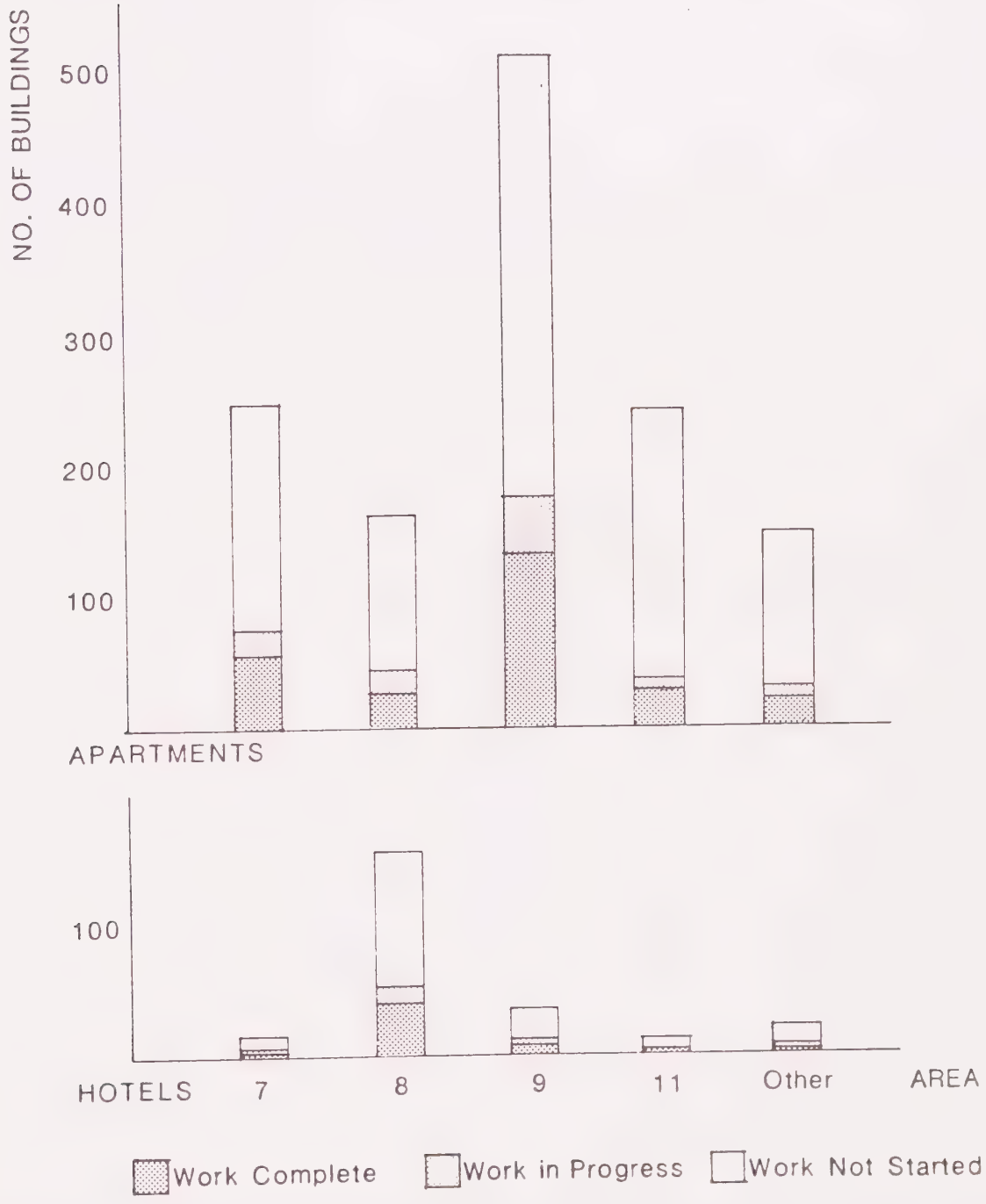
Area	Alt 1	Anchor 1	Anchor 2	Construction Completed (Total)	Construction In Progress	Total Bldgs.
7	2	0	0	2	2	16
8	17	23	0	40	10	157
9	3	3	0	6	5	39
11	2	2	0	4	0	12
Other	3	0	0	3	3	21
Total	27	28	0	55	20	245

Source: Department of Building and Safety, Earthquake Safety Division, 7/18/88.

FIGURE 20

APARTMENTS & HOTELS:

FINISHED CONSTRUCTION & UNDER CONSTRUCTION



Source: Department of Building and Safety, Earthquake Safety Division, 7/18/88.

Table 21

Properties Which Have Finished Construction Or Under Construction

Apartments and Hotels

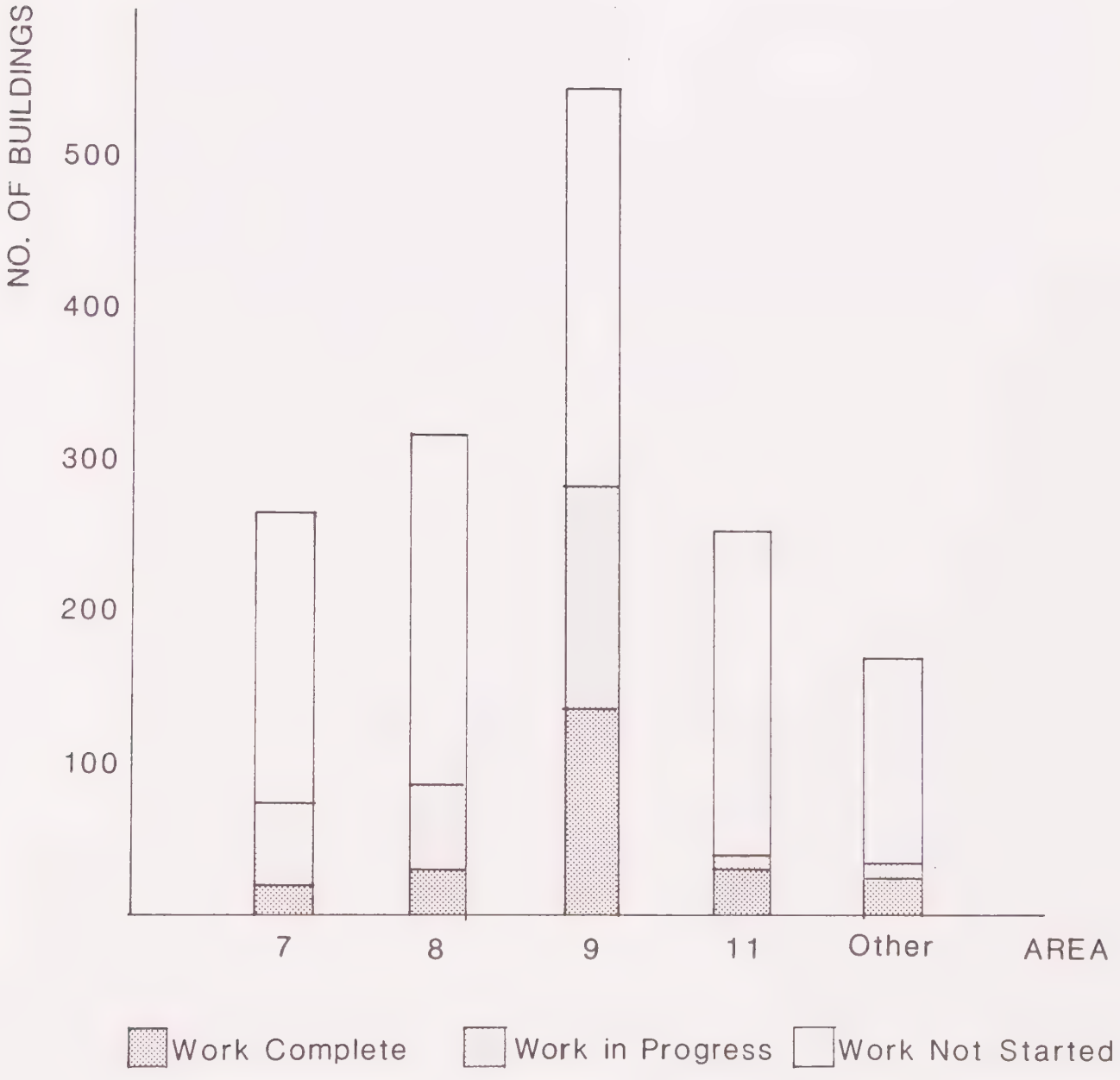
Area	Alt 1	Anchor 1	Anchor 2	Construction Completed (Total)	Construction In Progress	Total Bldgs.
7	50	6	1	57	21	263
8	35	29	1	65	28	319
9	126	12	1	139	47	551
11	20	11	0	31	7	255
Other	22	2	0	24	11	170
Total	253	60	3	316	114	1558

Source: Department of Building and Safety, Earthquake Safety Division, 7/18/88.

FIGURE 22

NUMBER OF PROPERTIES:

FINISHED CONSTRUCTION & UNDER CONSTRUCTION



Source: Department of Building and Safety, Earthquake Safety Division, 7/18/88.

Table 23

Properties Which Have Not Yet Started Construction

Apartments and Hotels

Area	Started	Not Started Construction	Total
7	78	185 (67%)	263
8	93	226 (71%)	319
9	186	365 (66%)	551
11	38	217 (82%)	255
Other	35	135 (79%)	170
Total	430	1128 (71%)	1558

Source: Department of Building and Safety, Earthquake Safety Division, 7/12/88.

D. Characteristics of Buildings not yet in Compliance

From the data presented in Chapter 2 regarding the use, height and size of typical unreinforced masonry (URM) residential buildings we know that half the buildings are single use residential and half are mixed-use (typically a building with store fronts at the ground level and apartments or hotel rooms on the second and third floors). Further, the majority of the mixed use buildings are two story, whereas the majority of single use residential buildings are three story (see Figure 2 and Table 3).

All the buildings which have received financial assistance for rehabilitation either from the Housing Division of the Community Development Department or the Community Redevelopment Agency have been single use, and typically three story buildings. Further, the average size and height of buildings which have completed construction are typically larger, three story buildings (see Table 24). This implies that the bulk of the buildings which have not yet started construction, and/or those buildings which have not yet complied with the citation are the two story, mixed use buildings.

Based on the cost information in previous chapters, this is particularly significant because:

1. Smaller buildings have much higher costs per unit;

2. There is less experience with construction on the mixed use residential buildings;

3. It is more difficult to separate the costs and a portion to the commercial, plus a portion to the residential space; and,

4. The construction costs on mixed use buildings will more than likely be higher because there are greater engineering complexities in buildings with a commercial ground floor.

In essence, the buildings which have been completed were the most straight-forward, in terms of construction, and the least expensive, in terms of cost per unit. Those that have not yet complied will be more difficult and more costly.

Table 24

Average Number Of Units And Stories
For Buildings In Earthquake File

Apartments	
Average units - bldgs. not started: From 932 buildings (27 additional bldgs. had no unit data)	21
Average stories - bldgs. not started: From 958 buildings (1 additional bldg. had no story data)	2
Average units - bldgs. started: From 349 buildings (5 additional bldgs. had no unit data)	27
Average stories - bldgs. started: From 354 buildings (0 additional bldgs. had no story data)	3
Number of Properties with Apartments:	1313
Hotels	
Average units - bldgs. not started: From 158 buildings (12 additional bldgs. had no unit data)	65
Average stories - bldgs. not started: From 170 buildings (0 additional bldgs. had no story data)	3
Average units - bldgs. started: From 69 buildings (6 additional bldgs. had no unit data)	65
Average stories - bldgs. started: From 75 buildings (0 additional bldgs. had no story data)	3
Number of properties with hotels:	245

Source: Department of Building and Safety, Earthquake Safety Division, 7/12/88.

E. Impact on Tenants Rents

The clearest and most significant impact is the potential loss to demolition or abandonment of a minimum of 8,000 housing units with predominantly low-income elderly and minority tenants.[24] These units provide a critical housing resource to individuals and families who will find it very difficult to find replacement housing within their neighborhoods at an affordable rent.

Further, it cannot be certain that 59% of the buildings or 27,000+ housing units in buildings where the owners have submitted plans and/or received permits will actually be renovated. It is possible that many of these owners may find the cost of renovation "uneconomic, or they may not qualify for conventional financing." Thus the real number of units which may be lost could be much higher.

In the 15 buildings surveyed in 1987, the cost of seismic upgrading ranged from $7-12 per square foot (or, $4,000 to $7,000 per unit). The total cost of rehabiliation ranged from $12-45 per square foot (or, $10,000 to $20,000 per unit). In the same year, 11 building owners applied for rent increases, with the average increase at $69 and the highest increase at $144 (see Table 25). In 1988, many more building owners applied for either a Cited Rehabiliation or Capital Improvement Rent Increase. The majority of these were for seismic rehabilitation work and the average rent increase ranged from $64 to $72, with the highest increase at $171. (See Table 26)

In 1987, when the cost data was originally compiled, the researchers predicted that construction costs would go down as contractors became more familiar with the seismic rehab process. This prediction, unfortunately, has not proved to be correct. According to Al Asakura, Director of the Earthquake Safety Division, the price of seismic rehab has gone up for 2 reasons: 1) there is a great deal of work and not enough contractors to fill the demand, and 2) the buildings that are left to do are more difficult both in engineering and construction terms.

Thus, the buildings that have not yet complied with the ordinance will cost as much or more than those already completed. And, because the majority of those left are two story mixed use buildings with fewer than the average number of residential units, the cost is likely to be substantially

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24. To date, 8% of the residential buildings, or approximately 3700 housing units, have been demolished. 9% have not responded to any notification by Building and Safety. This represents another 4,400 units in serious jeopardy.

higher. This is very bad news for tenants in Community Areas 7, 8, 9 and 11, with 90% of the City's unreinforced masonry residential buildings and two-thirds of the City's low and moderate income population.

These people currently pay rents of $399 to $483 per month. A rent increase of $64 to $72 is a 13-14% increase for people already paying 39-58% of their income on rent. Assuming the costs of seismic rehab will rise, a rent increase of $100 per month would be a 17-20% jump in their housing costs and would increase the average rent-to-income ratio in these areas to 40-69%.

While these increases will be devastating to many tenants, it is not clear that building owners would be able to pass through the full cost of seismic compliance. In these neighborhoods, rent increases of $70-$100 may be more than the local market will bear. Tenants may look for other accomodations in non-brick buildings and landlords may find themselves with a safer but unmarketable building.

Table 25

1987 Cited Rehabiliation Data:
Rent Increases

Range	#	%
Greater than $100.00	2	18 %
$50.00 - $99.00	5	45 %
$40.00 - $49.00	2	18 %
$30.00 - $39.00	2	18 %
$20.00 - $29.00	0	
$10.00 - $19.00	0	
$ 5.00 - $ 9.00	0	
Less than $5.00	0	
TOTAL CASE NUMBER:	11	100 %

Average Increase:	$ 68.67
Median:	$ 66.28
High Quartile:	$ 77.75
Low Quartile:	$ 40.61
Highest Increase:	$144.04
Lowest Increase:	$ 29.80

Source: Rent Stabilization Division, Community Development Department, January 1989.

Table 26

1988 Seismic Rehabilitation:
Rent Increase Cases

The following information is for buildings that either a Cited Rehabiliatation or Capital Improvement rent increase application was made and approved for seismic work. Besides the seismic work, some owners also applied for Dorothy Mae work, interest on Seismic and/or Dorothy Mae, and Capital Improvement done at the same time. The following is a breakdown of these costs for buildings approved for seismic increases.

MONTHLY INCREASE	SEISMIC AND INTEREST	SEISMIC, D.M. AND INTEREST	SEISMIC, D.M. INTEREST AND CAPITAL IMPROVEMENT
Average	$ 64.68	$ 65.26	$ 72.22
Median	59.40	60.58	64.65
Low Quartile	51.32	51.32	55.17
High Quartile	71.53	71.53	85.74
Lowest	26.67	26.67	37.08
Highest	163.81	163.81	171.69
# of Approvals	60 Seismic	9 Dorothy Mae	22 Capital Improv.

Source: Rent Stabilization Division, Community Development Department, January 1989.

VI. RECOMMENDATIONS

Controllable Cost Factors

The factors which affect upgrade cost are summarized in this section and grouped into three categories: A) Existing conditions, B) Regulations and Design, C) External Factors. Many of these issues have been discussed in detail in section III of this report. A synopsis is presented here to aid the discussion of recommendations.

A. Existing Conditions -- The variation on original construction will affect the upgrade cost. The primary factors are: 1) building height, 2) configuration, 3) footprint size, 4) amount of window penetration, 5) the type of diaphragm, 6) roof configuration, 7) level of architectural finish, and 8) strength of existing materials. Although these factors can affect cost, the original construction of rectangular 3-4 story residential buildings in Los Angeles does not differ greatly. As a result, these factors have a minor effect on comparative construction costs. It should be noted that these buildings do have differing size units and some have storage basements. Larger and fewer units in a building yields a higher cost per unit. Similarly, if the basement area is counted, the cost per sq.ft. would be lower. Therefore, significant variation in the cost per unit or per square foot may be a result of building size and unit count (for example, see case study #1).

The most critical cost element in an existing building is the "unknown conditions," such as the location of structure and strength of existing materials. Because information is often lacking until actual construcution work begins, these conditions can require changes in design. While these may or may not be high cost items in themselves, the approval of change orders prolongs the construction process, and inevitably increases cost.

B. Regulations and Design -- In terms of regulation, the type of retrofit method used will substantially effect the cost. The recently approved RGA method will be less expensive, compared to the conventional method, mainly due to higher values given to existing materials and innovative strengthening procedures involving minimum demolition. In terms of retrofit design, the knowledge and experience of the engineer, architect, and contractors involved will undoubtedly affect cost. A poor strengthening scheme, without consideration for architectural cost, or a scheme poorly executed by the contractor can easily double the cost. Yet, the economy of an engineering design is not always positive. Code minimum solutions may not completely

fulfill the intention of the ordinance. A conscientious and experienced engineer may require higher fees, but is likely to produce quality and economical designs.

C. External Factors -- There are a number of influencing factors in this category. They can briefly be described as follows:

1) As experience is acquired and information becomes available, retrofit work, in general, becomes less expensive. This effect can be described as the "learning curve" where the beginning of a new type of work always takes much more effort.

2) There is a need for creating additional amenities along with the seismic upgrade as tenants generally tend to regard seismic upgrading as a benefit not worthy of the additional rent. This cost of additional renovation is an indirect cost associated with the seismic work. In the poorest areas, however, tenants may be unable to afford either the seismic or the cosmetic upgrade.

3) The nature of the development/construction industry undoubtedly adds complications to the cost picture. As an example, some developers have submitted overly conservative engineering design before a contract has been secured with the funding agencies. After a contract has been secured, the engineering design is reworked to produce a less costly design and to produce a higher margin of profit.

4) Construction delay probably represents the most critical cost factor. Major issues which cause delay are: a) unknown nature of rehabilitation, b) design changes, and c) tenants remaining in place during construction. Construction time can be reduced if the approval process can be shortened. Better coordination between CDD and the Department of Building and Safety, as well as coordination within the Department of Building and Safety (i.e. plan check and inspection), can expedite the process. The use of deputy inspectors can also reduce the approval time. Prolonged construction, in general, will have a great effect on overall project cost, although it is not apparent in the construction cost figures. The cost of delays is in the loss of rent income and higher financial soft costs.

In short, the existing conditions are relatively set. Intervention measure, for all practical purposes, cannot significantly change the upgrading cost in this area. Regulation and design factors are primarily controlled by

the seismic ordinance and officially recognized methods by which the ordinance requirements can be satisfied. Clearly, the knowledge and experience of the professionals involved influence the cost in this category. The external factors tend to affect construction cost by affecting construction time. Thus, intervention measures taken in this area are probably the most effective in cost reduction.

Intervention Measures

The cost of seismic upgrading is important because it affects the economic viability of every building. Excessive costs may force owners to demolish residential buildings or cause rent increases that displace existing tenants and make the building uncompetitive in the marketplace. Thus, if cost reduction is one goal, then a reduction of the standard is one way to achieve it. Most engineers and building officials, however, agree that the current RGA requirements represent the minimum standards. Thus, simplifying procedures and expediting the approval and inspection process is the only real means of achieving reductions in cost. If making city funding available to more building owners is another goal, then limiting the loan value to the cost of seismic work is one approach. Another would be to allow residential building owners more time to comply, so that the city's contribution (in terms of low interest loans) can be spread over a longer time period. Other goals, from construction quality assurance, to regulation of rent increases, have potential solutions in adjustment to administrative policy.

Cost, however, is only one aspect of the Seismic Rehabilitation Program. Preservation of the existing housing stock is clearly another. Approximately 67% of the building owners have not yet started construction, even though the time line for completion (established after the Mexico City earthquake) would have required all residential buildings to have started construction by December 1988. Thus, the fact that the City could begin ordering the demolition of so many buildings, along with the real limitations of available City funding, suggests that current City policies and procedures for earthquake hazards mitigation pose a direct threat to a significant portion of the City's low income housing stock.

There are two ways the City of Los Angeles can improve on the level of compliance with the ordinance, help residential building owners with the cost of seismic upgrading and insure that affordable housing units are not lost in the process:

1. Administrative procedures can be redesigned to expedite the process. Information aimed at helping owners, CDD project managers and professionals with guidelines for appropriate housing rehabilitation methods, standards, and costs, can be disseminated by the City through specific departments working directly with building owners and tenants. Further procedures within and between the Community Development Department, Housing and Building and Safety can be redesigned to expedite the funding, construction, and rent adjustment processes and reduce overall project costs.

2. Policy changes regarding the provision of funds, the length of time allowed for compliance, and allowable rent pass-throughs in conjunction with specific new rules aimed at housing preservation could serve to reinforce the Earthquake Hazards Mitigation Ordinance, reduce costs and prevent demolition and abandonment.

1. Administrative Procedures

The Housing Division is the first point of contact if a building owner is to receive City low-interest loans. The cases examined in this cost study show a fairly consistent range of costs for the seismic portion of the rehabilitation averaging $5-7,000 per unit but a significant variation in the total rehabilitation cost which ranged from $ 7,000 to $20,000 per unit. Because the residential buildings are fairly consistent in terms of their physical size and shape it is reasonable to assume that construction costs should also be consistent within a range that allows for variations in age, building conditions, maintenance, etc. If the Housing Division limited loan funds to $5-7,000 per unit (the amount needed for the seismic portion of the rehabilitation) they could provide assistance to a greater number of building owners. Further, they could require owners requesting additional funds to justify higher-than-normal costs.[25] Also, because the City is providing owners with low-interest loans, they have a right to review the appropriateness of the plans submitted as well as recommend engineering consultants.

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25. Two story mixed use buildings, for example, may prove more costly because there are large openings for the commercial space, and fewer units per building on the average. Only a small number of these buildings have been completed at the time of this report, thus we do not have accurate cost data for this building type.

Recommendations:

- o Cap seismic loan amounts from CDD at an average cost per S.F.
- o Decrease the funding for general rehabilitation.
- o Have an engineer in CDD who sets the "acceptable range."
- o CDD should provide owners with a list of acceptable engineers.

The Department of Building and Safety is primarily responsible for enforcing the ordinance and there are a number of procedural changes which could expedite the permit and inspection process, thus saving time and money in construction delays, and equally important limiting disruption to tenants living in buildings under construction.

First, Building and Safety should give all occupied residential buildings priority in the plan checking process. This could be done on the condition that tenants not be removed from their units. This could save several weeks in approval time. Second, and even more critical is the need to expedite procedures during construction. Rehabilitation work is inevitably filled with delays that result from unknown conditions within the building. At present when a significant change of plans is required, construction work stops while the drawings are resubmitted to Building and Safety. These drawings stand in line with all the others going through the plan check process. It seems appropriate that when there are design changes necessary in residential buildings, the inspector could provide the owner and contractor with standardized approved details. If these are accepted work continues, and the project is not delayed by re-design and plan check.

It is important to note that the residential URM buildings are very similar in size, shape and method of construction. As such, the use of standardized details is appropriate even though it may not apply in every situation. Further, to process plan changes that cannot be managed in the field, Building and Safety should set aside time each day to expedite change orders. Finally, Building and Safety should be collecting fees commensurate with the actual construction value in order to better support the services they provide. As Table 8 shows, permit valuations have been significantly lower that actual

construction costs. The problem is procedural. Building and Safety does not require the contractor's cost estimate, but bases its fee on a standardized cost per square foot set early in the Rehabilitation program. These standard fees do not appear to correspond to actual construction costs.

Because this study provides the first detailed cost comparison on completed projects, the Department of Building and Safety can now set permit valuation rates commensurate with typical costs. If owners protest, arguing that their building cost are lower, then a procedure for rebating an overcharge could be established. For example, if an owner believes his costs are less than the Building and Safety permit valuation, he or she can bring in the certification of costs used to substantiate rent increases and apply for a permit fee rebate. Thus the owners would be required to use the same data for both paying fees to Building and Safety and applying to Rent Stabilization for a rent increase. In the interim, Building and Safety will not be forced to under-estimate the great majority of construction costs and lose fees which support its operation.

Recommendations:

- **Give occupied residential buildings priority in plan check.**
- **Allow standardized details to be used in change orders.**
- **Set aside time each day for processing changes.**
- **Charge fees commensurate with actual construction costs.**

It should be pointed out that the intention inherent in all the recommendations is not to criticize existing procedures, but to improve them in order to reduce costs, save time, lessen the impact of seismic upgrading on tenants, and keep residential buildings occupied and in service.

Checks and Balances are essential to smooth operations in any program where the administration crosses numerous city departments. In the enforcement of the Earthquake Hazards Reduction Ordinance, there needs to be better co-ordination between those who provide the funding (Housing), those who enforce the ordinance

(Building and Safety), and those who must assess costs and pass on rent increases to tenants (Rent Stabilization).

The case studies showed that an owner could submit one plan to Housing and another to Building and Safety, and that owners have consistently under-represented the value of their construction costs to Building and Safety. In fact, there needs to be standardized submittal formats for plans, cost estimates and work write-ups so that the Rehab Coordinator in Housing and the Plan Checker in Building and Safety are reviewing the same documents and change orders. This will also allow the City to verify construction costs for both the loan application and the permit valuation. Further, a great deal of time could be saved if there were a required "building walk-through" with the rehab coordinator from Housing, the plan checker from Building and Safety, the owner and the engineer. This co-ordination could serve all parties involved in the process, by providing a forum for answering questions and establishing a project schedule.

It would be particularly useful to Rent Stabilization if landlords were required to file a "Tenant Plan" at the same time that they filed drawings for a permit. This would allow Rent Stabilization to review the owner's plans early on to assure that proper notifications, relocation payments and/or rent adjustments are made in a timely fashion. This ultimately would help the building owner to expedite construction and reduce delays.

Recommendations:

- **Co-ordinate documents and submittals with all affected departments.**
- **Require a team building walk-through before loans are approved and permits given.**
- **Require owners to file a Tenant Inconvenience and/or temporary relocation plan with Rent Stabilization before a building permit is pulled.**

Rent Stabilization could and should make it easier for building owners to combine their requests for rent increases based on capital improvements and cited rehabilitation. Currently these are separate, non-overlapping applications. In deference to tenants

it seems particularly unfair to allow imputed interest rates on cited rehab when the majority of owners are receiving low-interest loans. Thus it is appropriate that only real finance costs are passed through on seismic upgrading and compliance with Dorothy Mae for the installation of quick-release window bars, smoke detectors and impact hazard glass.

Recommendations:

- **Simplify the rent-increase application process, particularly when the work is a combination of seismic and general rehab.**
- **Allow only real finance costs on cited rehab when computing rent increases.**
- **Consider the appropriateness of allowing interest when the owner has received a deferred-interest loan from the Community Development Department.**

Finally, the Community Development Department and the Community Redevelopment Agency should address the issue of service and jurisdiction. That is they should review how buildings which fall under CRA jusrisdiction could be separated from those funded by Community Development.

According to CRA policy documents they have provided funding for 47 buildings of which 40 are in their project area and 6 are located "city-wide". According to their count 150 buildings (or approximately 7,500 units) are located in the following CRA project areas: Central City East, South Park, the remainder of the Central Business District and Other Areas. If our estimates are correct, and approximately 350 apartment buildings and approximately 50 hotels have not yet complied, then almost 40% are in CRA jurisdiction.

Clearly, outreach and funding programs must involve both CDD and CRA. The scale of the problem is too large to be limited to any single agency or division.

2. Policy Changes

In addition to the administrative changes, the researchers recommend that the City Council take action to underscore their committment to earthquake safety and affordable housing.

A. **Implement a demolition control rule.**

This is the most significant and important policy recommendation with some 3700 housing units already lost, 4400 seriously in danger of being demolished,[26] and 59% or 27,000 housing units in buildings which are "in process" but have not yet started construction, action must be taken to prevent the demolition of an important affordable housing resource in the City.

The intention is to save and seismicly upgrade this housing stock. When a residential building is ordered demolished, the landlord is required to pay the evicted tenants $2,500 in relocation fees. It seems obvious that if seismic work can be done for $5,000 per unit, it is worth both the cost and the effort to maintain the unit.

Thus, a demolition control rule might involve the following procedures.

1. Before an owner can evict tenants and order the building demolished the owner must submit plans and a cost estimate for the seismic rehab to the City. Clearly there will be buildings which are too costly to repair and should be torn down. However, if the cost figures provided by the owner seem excessive, Building and Safety should review the plans and costs to provide some judgement on the accuracy and credibility of the submittal.

2. Before a demolition permit is allowed, the owner must meet with staff in the Housing Division, to review all the possible financing options available from the city. Clearly if an owner is engaged in this process, a time extension should be granted by Building and Safety.

3. If the owner still wants to demolish the building, the City would restrict any future use of the land for housing. Alternatively, the City could require a deed restriction which states that if and when the land is used for any use other than housing the owner must pay an in-lieu fee to a city-wide affordable housing production fund.

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26. Because the owners of these buildings have not responded to any notification to comply with the ordinance since 1986.

While there are many possible ways the City could structure such a policy, the recommendation is focused on saving the existing stock where possible and recognizing that if the owner of an unreinforced masonry residential building stands to profit from demolishing that building and replacing it with a commercial structure, despite the City's best efforts to provide renovation financing, then that owner should be required to pay some portion of the gain to an affordable housing fund.

B. **Limit the amount of City financing to the cost of seismic upgrading, critical code requirements plus a minimum for improving architectural finishes.**

The intention here is to avoid the level of deep subsidy provided in many of the examples in this report. The City simply does not have the resources to provide full renovation financing on every unreinforced masonry residential building, and the researchers believe the best use of limited state and federal funds is to provide to as many building owners as possible. Even if only 50% of the units received loans for $5,000 of work per unit, the price tag would be $116 million. With 67% of units not yet under construction the shallow but broadly based subsidy will be most appropriate for the goal of reserving the existing affordable housing stock.

C. **Limit the rent increases to tenants in seismic rehab buildings to less than $100 per month.**

Although the average increase has been approximately $72 per month, there have been cases where the rent increase was as high as $172 per month. Further, construction costs have risen because 1) there are a limited number of contractors and a good deal of demand in the market, and 2) the easiest buildings have been completed. Those that remain are typically two story mixed use buildings with fewer units than the average residential building.

The intention then is to restructure the rent increase so that the burden on the tenants, who already pay 40-60% of their incomes on rent, is not overwhelming. One current policy change being considered will no longer allow the Capital

Improvement rent increase to be continued in perpetuity. For seismic buildings the city could make the amortization schedules longer, and allow the landlord to recoup the costs over a longer period. The City could also structure Cited Rehab so that a rent increase over $100 per month acts as a surcharge, and does not increase the base rent on the unit.

New rules such as these could be combined with a review of the definition of "substantial renovation" so that if more than $10,000 is spent on primarily Cited Rehab, the unit does not automatically qualify to be removed from rent control. Clearly the seismic and fire code requirements were not in effect when the current definition of substantial rehab was drafted. Here again, the policy recommendations are aimed at preserving and repairing the existing housing stock with an eye towards fairness for both landlord and tenant.

Conclusion

In summary, the Earthquake Hazards Reduction Ordinance is an important measure designed to protect the life-safety of the citizens of Los Angeles. When it was developed, it was not possible to forsee all the ramifications of its enforcement. Thus, this report reviewed the specific impact the Earthquake Hazards Reduction Ordinance has had on residential buildings. The study found that:

1. The cost of seismic upgrading was higher than originally anticipated by Building and Safety;

2. Less than one-quarter of the residential buildings have been completed in the time frame allocated; and

3. The majority of the residential buildings affected are concentrated in central city neighborhoods (Hollywood Wilshire, Westlake and Downtown) populated by poor, elderly and ethnic minority tenants.

As such, the study recommends several steps to improve and streamline administrative procedures both within and between Community Development and Building & Safety. In addition, we recommend policy changes to insure that the existing inner-city affordable housing stock is not demolished by a process designed to improve the building stock and extend its useful life. The proposals and recommendations

contained in this study recognize seismic safety and housing conservation as important policy priorities for the City of Los Angeles.

APPENDIX

DATA FORMAT

The case studies surveyed are documented here in a consistant manner so that the data can be compared. the synopsis of data is organized into six sections:

Section I contains basic information and needs no further explanation.

Section II lists the building statistics. It should be noted that the total floor area represents residential area and does not include basements. Most of the floor areas are measured from drawings, but where drawings are not available they are taken from CDD project file.

Section III is the overall summary page indicating sources of funding and expenditures, as well as costs per square foot and per unit. The expenditure is divided into seismic and other rehab costs. Each category includes fees and permit costs as well as profit, overhead and general requirements. Soft costs related to financing are included under other rehab cost. Thus, the actual seismic cost may be somewhat higher, in that the figures presented represent construction costs, fees and permits, but no financial costs.

Section IV is a breakdown of the costs attributed to seismic work. It shows all the categories of work related to strengthening and indicates how much of the work is attributable to seismic retrofit. The major criteria for the attribution is as follows:

> All seismic structural work is undoubtedly 100% attributed to strengthening. Architectural refinishing such as carpeting and vinyl floor tile are considered 50% seismic, if the method used for strengthening is standard Div. 88 and 0% for RGA. Painting is considered 50% seismic, if a plywood panel system is used and is considered as 25% otherwise. Electrical, plumbing and cabinetry are not attributed to seismic as these can be avoided with careful planning. The amount of general requirements given to seismic is proportional to the ratio of seismic to total construction cost. The above values for attribution are chosen to represent the necessary cost to refinish and restore a building after upgrade to its original level of finish. Thus, the above criteria was used with discretion for the individual case.

Section V is a cost summary of the entire construction project. This summary is either from the original CDD contract or from the owner's breakdown submitted in the CDD

project file. It should be noted that the seismic cost listed under this breakdown is usually only the structural seismic work and does not include architectural work, fees, permits, general requirements, or profit and overhead. This figure does not reflect the full seismic cost and should not be interpreted as such. The actual seismic cost is determined in section IV.

Section VI is a summary of the reconstruction work and is included to indicate the scope of work and to explain the nature of the costs listed in the previous sections.

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

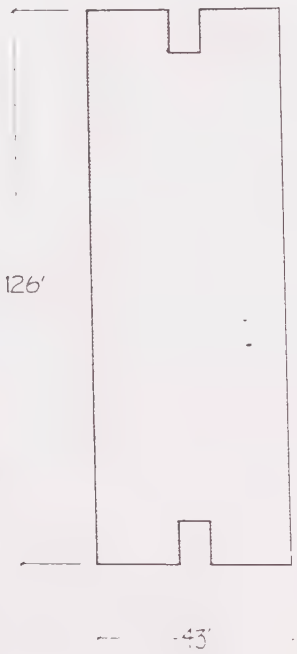
Address: 341 S. Gramery Pl.
Owner: Eldon T. Perry
Contractor: Alta Construction Co.
Engineer: Wheeler & Gray Consulting Engineers
CDD Construction
Specialist: Rosie Wimbish

II. BUILDING DATA:

No. of stories: 3 Shape: rectangular

No. of units: 12 Total Floor Area: 14,769[1] Sq.Ft.

Special Conditions/Description:
Long and narrow building with basement at the front portion of the building.



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1. Square footage does not include basement area.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 170,000

B. Source of Funds

CDBG Deferred Loan	$109,725
Rental Rehab Grant	$ 18,000
Rental Rehab Loan	$ 40,000
Private Financing	$ 18,000

Total Funding: $ 185,725

C. Expenditures -

1. Seismic Costs:

seismic struct & arch	$124,835[2]
permits and fees	$ 16,653
profit and overhead	-----[3]
performace bond	$ 2,440

Seismic Subtotal: $143,928

2. Other Rehab costs:

Other rehab work	$ 26,144
fees, permits,	$ 4,455
performance bond	$ 500
profit and overhead	-----[4]

General Subtotal: $ 31,099

Total Expenditure: $ 175,027

Contingency not expended: $ 10,698[5]

Total Seismic Cost: $9.75 per/sq. ft. $11,994 per/unit

Total Cost: $11.85 per/sq. ft. $14,585 per/unit

---

2. Structural and Architectural costs cannot be separated in construction record.

3. Profit and overhead included in seismic structural and architectural.

4. Profit and overhead included in rehab work amount.

5. Contingency amount not expended applied to repayment of loan.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
Alta Construction Co.	$ 143,476	$ 119,085
Carpet	3,500	1,750
Tile	1,776	0
Overhead and profit		included above
Subtotal		120,835
Change Orders:		
Anchors & Brackets	1,100	1,100
Remove brick, add'l gunite, Testing/Inspection	2,900	2,900

Summary:

Seismic Total	124,835
All Others	26,144
Total Hard Cost[6]	$ 150,979

6. Total includes change order amounts.

V. CONSTRUCTION COST SUMMARY[7]

Structural Engineering Fee	$ 17,603.00
Rehabilitation Contract	$ 146,979.00
Bond 2%	$ 2,940.00
Contingency	$ 14,698.00
Meters (DWP Estimate)	$ 3,000.00
Fees & Title Insurance	$ 505.00
	$ 185,725.00

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7. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt
Combination system with continuous steel angle thru-bolted into masonry wall, steel strapping and blocking. All done at the ceiling level.

Diaphragm Work
Approximately 850 sq.ft. of plywood diaphragm has been added at the underside of the ceiling at the narrow bays in the front and rear.

Transverse and Longitudinal Brace
4" gunite wall in front and rear facade. One additional transverse line of shear wall at center. This wall consists of concrete on the 1st and 2nd floor and plywood shear panel on the 3rd floor. Bracing included connection to roof diaphragm.

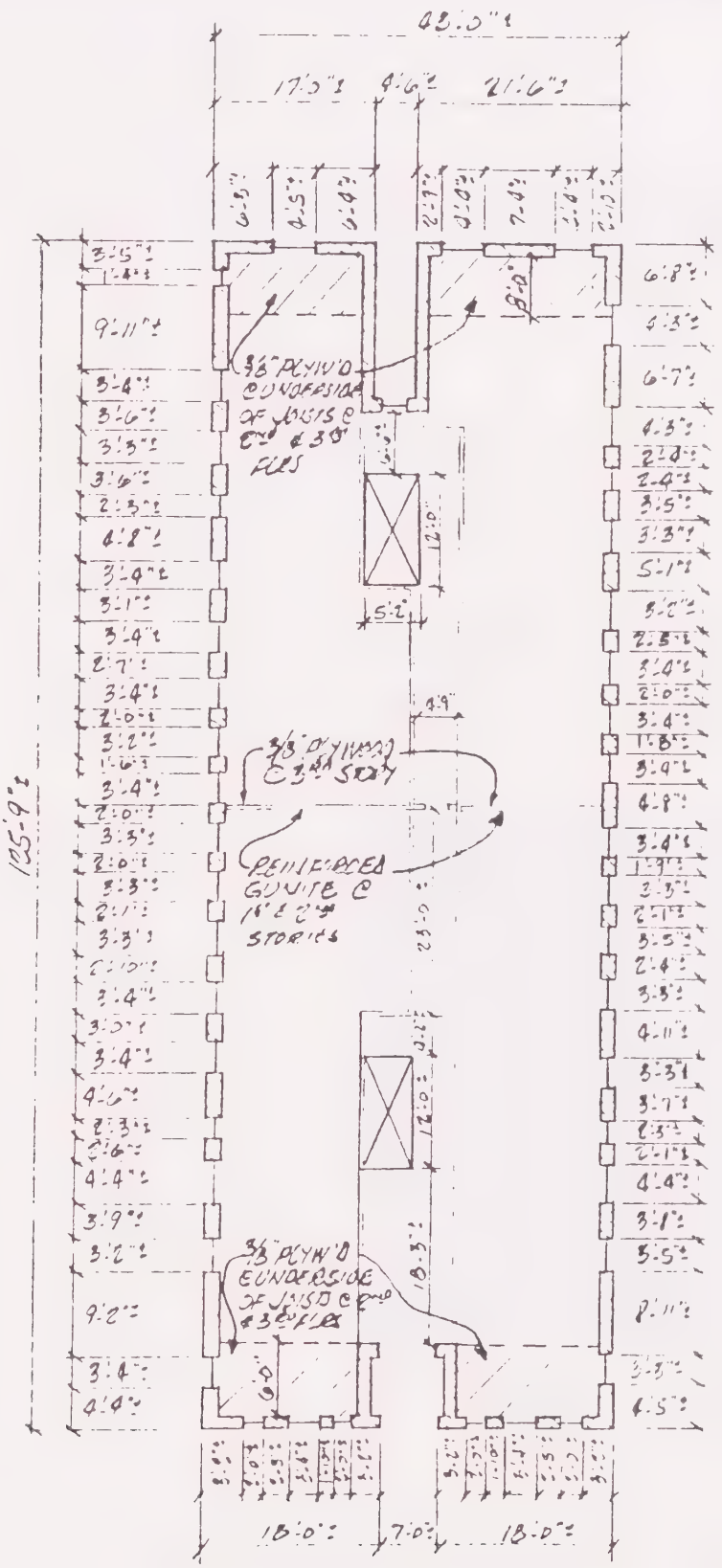
Foundation
Foundation added to support new shear wall.

General:

Interior Partition.....none
Doors and Windows.....none
Wall and Ceiling Surface Repair.....none
Flooring and Carpet.....minor
Painting and Decoration.....none
Kitchen and Bath Cabinetry.....none
Kitchen Appliance.....none
Elevator.....none
Plumbing.....none
Kitchen and Bath Fixture.....none
HVAC.....none
Electrical.....none
Site Improvement.....none
Security System, Intercom.....moderate
Dorthy Mae Ordinance.....major

VII. NOTES:

This reconstruction was done with the tenant in place. Owner hired a good structural engineer per the City's recommendation. However, he had difficulties with his contractor. The owner owns one URM building and is not an experienced developer.



341 S. GRAMERCY TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

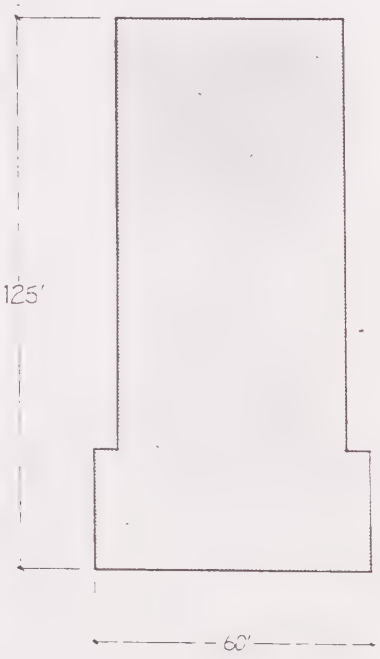
Address: 514 S. Union Drive
Owner: JRAM
Contractor: Lehigh Engineers & Construction
Engineer: F. Houriani/Lehigh Construction
CDD Construction
Specialist: P.G. Meyerson

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 47 Total Floor Area: 24,100 [1] Sq. Ft.

Special Conditions/Description:
Basement approximately 10,000 sq.ft., clay tile at parapet.



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1. Square footage measured from plan.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 168,000

B. Source of Funds

City CDBG	$ 400,000
City Rental Rehab	$ 100,000
Private Financing	$ 150,000

Total Funding: $ 650,000[2]

C. Expenditures -

1. Seismic Costs

seismic structural	$ 175,745
seismic architectural	$ 7,999
permits and fees	-----[3]
profit and overhead	-----[3]
performace bond	-----[3]

Seismic Subtotal: $ 183,744

2. Other Rehab costs:

Other rehab work	$ 423,897
fees, permits, profit, overhead and bond	-----[4]
title insurance	$ 1,976

General Subtotal: $ 425,873

Total Expenditure: $ 609,617[5]

Seismic Structural: $ 7.29 per/sq. ft.

Seismic Architectural: $ 0.33 per/sq. ft.

Total Seismic Cost: $ 7.62 per/sq. ft. $ 3,909 per/unit

Total Cost: $25.30 per/sq. ft. $12,970 per/unit

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2. Contingency amount not expended applied to repayment of loan.

3. Included in seismic structural.

4. Included in other rehab cost.

5. Additional expense claimed by owner not included is approx. $100,000.

IV. **BREAKDOWN OF SEISMIC COST:**

Items	Contract Amount	Amount Attributed to Seismic
1. Earthquake Hazard Reduction (include test and engineering)	$ 158,000	$ 158,000
2. Refinish for Seismic Work (painting not included)	14,300	14,300
33. Paint kitchen & bath w/oil based paint	5,405	2,702
44. Paint living room & bdrms	-0-	-0-
45. Vinyl floor - kitchen	4,662	2,331
Vinyl floor - bathroom	2,632	1,316
Overhead and profit for items #33-#45 (12%)		761
Change Orders:		
#33 reduced from 17,000 to 5,405 by $11,505	-0-	-0-
#44 reduced from 9,390 to -0-	-0-	-0-
Performance Bonds:		
2% bond for seismic struct		3,446
1.75% bond for others		889
Not in Contract: new carpet and painting		

Summary:

Seismic Structural: $ 175,746

Seismic Architectural: $7,999

Seismic Total	$ 183,745
All Others	$ 423,897
Total Hard Cost[6]	$ 607,642

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6. Total amount includes change order deduction from original contract (-$40,382).

V. CONSTRUCTION COST SUMMARY[7]

Earthquake Reinforcement	$ 172,300.00
Dorothy Mae Orindance	$ 32,775.00
Building Exterior	$ 13,125.00
Building Common Areas	$ 104,038.00
Elevator	$ 22,500.00
Termite Related construction Work as Per Request	$ -0-
Interior Common to all Apartments	$ 212,794.00
Specific to all Apartments #35 and 41	$ 8,413.00
Pacific Energy (Solar)	$ 28,900.00
Construction Subtotal	$ 594,845.00
Contractor's Overhead & Profit (12%) for Cauecohe's Construction ($371,145)	$ 44,537.00
Construction Total	$ 639,382.00
100% Performance & 50% payment Bond	$ 3,446.00
Lehigh (2%) Cauecohe (1.25%)	$ 5,196.00
All Construction Permits	included
Termite Treatment	by owner
Contract Total	$ 648,024.00
Total Change Orders[8]	$ -40,382.00
Total	$ 607,642.00

---

7. Taken from cost breakdowns in Community Development Department project files.

8. Change orders added to contract amount to represent final construction cost.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolting are combined using an angle iron approximately 10" long. These are placed above the floor diaphragm.

Diaphragm Work

Diaphragm was strengthened in 4 or 5 units.

Transverse and Longitudinal Brace

Three lines of transverse steel brace frame have been added at the first floor. Apparently the frames are covered with plywood sheathing. A longitudinal line of plywood sheathing has also been added at the first floor. The second floor has three transverse and one longitudinal lines of plywood shear walls over the first floor walls. The third floor has one additional longitudinal shear wall while the fourth floor has one additional longitudinal and three additional transverse plywood walls. In addition, four columns of windows have been filled in the front facade and two columns filled in the rear.

Foundation

Three lines of concrete grade beams have been added under new steel frames.

General:

Interior Partition.....none
Doors and Windows.....none
Wall and Ceiling Surface Repair.....minor
Flooring and Carpet.....minor
Painting and Decoration.....minor
Kitchen and Bath Cabinetry.....major
Kitchen Appliance.....minor
Elevator.....moderate
Plumbing.....major
Kitchen and Bath Fixture.....minor
HVAC.....minor
Electrical.....major
Site Improvement.....none
Security System, Intercom.....major
Dorthy Mae Ordinance.....major
Miscellaneous - Solar Heating.....major

VII. NOTES:

This building is owned by an owner not experienced in renovation. It is his first and only seismic retrofit project. The work was done with one floor vacant at a time and construction lasted 18 months. The building is considered to be low-income, the architectural refinish grade is economical.

514 UNION TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 608 S. Dunsmuir
Owner: Donald Kaplan
Contractor: Parcco General Contractors
Engineer: ADS Assoc. Design & Engineering
CDD Construction Specialist: uncertain

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 32[1] Total Floor Area: 24,280 [1] Sq. Ft.

Special Conditions/Description:
Typical basic configuration approx. 60 x 100. Small gable roof at the front of building.

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1. Square footage and number of units from CDD Survey and cannot be verified with floor plans since they are not available.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 180,000

B. Source of Funds

CDBG Deferred Loan	$ 46,510
City Rental Rehab	$160,000
Private Financing	$160,000

Total Funding: $ 366,510

C. Expenditures -

1. Seismic Costs

seismic structural	$ 161,568
seismic architectural	$ 50,674
permits and fees	$ 5,652
profit and overhead	-----[2]

Seismic Subtotal: $ 217,894

2. Other Rehab costs:

Other rehab work	$ 109,376
fees, & permits	$ 4,742
title insurance	$ 868
other fees	$ 1,467

General Subtotal: $ 116,453

Total Expenditure: $ 334,347[3]

Contingency not expended: $ 32,162[4]

Seismic Structural: $ 6.83 per/sq. ft.

Seismic Architectural: $ 2.14 per/sq. ft.

Total Seismic Cost: $ 8.97 per/sq. ft. $ 6,809 per/unit

Total Cost: $13.77 per/sq. ft. $10,448 per/unit

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2. Profit and overhead included in seismic structural.

3. Additional cost claimed by owner, not included in total expenditure, is $24,545.

4. Contingency amount not expended applied to repayment of loan.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Seismic Reinforcement	132,000	132,000
4. Paint hallway	5,200	2,600
7. Remove & replace carpet	9,600	4,800
8. Patch plaster & paint	19,500	15,000
9. Remove & replace carpet	38,000	19,000
Subtotal		173,400
2% Bond		4,162

No Change Orders

Summary:

Seismic Structural: $ 161,568

Seismic Architectural: $ 50,674

Seismic Total	$ 212,242
All Others	$ 109,376
Total	$ 321,618

V. CONSTRUCTION COST SUMMARY[5]

Earthquake Reinforcement	$ 132,000.00
Dorothy Mae Orindance	$ 38,080.00
Building Exterior	$ -0-
Building Common Areas	$ 15,500.00
Elevator	$ -0-
Termite Related construction Work as Per Request	$ 255.00
Interior Common to all Apartments	$ 65,800.00
Specific to all Apartments	$ 9,930.00
Construction Subtotal	$ 261,535.00
Contractor's Overhead & Profit (20%)	$ 52,307.00
Construction Total	$ 313,842.00
100% Performance & 50% payment bond (2%)	$ 6,276.00
All Construction Permits	$ 1,500.00
Termite Treatment	-0-
Grand Total	$ 321.618.00

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5. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:
information not available

General:

Interior Partition	none
Doors and Windows	none
Wall and Ceiling Surface Repair	minor
Flooring and Carpet	minor
Painting and Decoration	none
Kitchen and Bath Cabinetry	minor
Kitchen Appliance	minor
Elevator	none
Plumbing	none
Kitchen and Bath Fixture	minor
HVAC	none
Electrical	none
Site Improvement	none
Security System, Intercom	major
Dorothy Mae Ordinance	major

Notes for the Vadehra Buildings

The Vadehra Buildings under study are:

112 S. Occidential
744 Catalina
3075 Harrington
3051 Leeward

Three of these buildings are a part of the six Mahal Apartments[1] and are retrofitted at the same time under a package financing. The soft costs and the fundings are thus grouped together in lump sums. To assess the costs for this study, these lump sums are divided and attributed to each of the buildings according to its construction valuation, since a more detailed breakdown is not available (see attached table). The hard costs used for the study is derived from the original contract amount and adjusted for change orders.

These buildings are renovated to have a "moderate" level of architectural finish, which means major improvements have been usually done along with the seismic upgrading.

Breakdown of Soft Costs between the Vadehra Buildings

	Total Hard Cost[2]	% of total
Hobart	801,000	18.8
Leeward	867,000	20.3
Wilton	788,000	18.5
Catalina	702,000	16.5
Irolo	586,000	13.7
Occidental	518,000	12.2
	4,262,000	100.0%

---

1. The Harrington building is similar but was financed separately.

2. This breakdown is based on hard cost since total hard & soft amount not available.

Breakdown of Soft Costs between the Vadehra Buildings

Soft Costs:	Total For 6 Bldgs.	Leeward 20.3%	Catalina 16.5%	Occidental 12.2%
Bond Premium	$37,000	$ 7,511	$ 6,105	$ 4,514
Plan Check, Surveying	36,171	7,345	5,968	4,413
Architect's Fee	85,000	17,255	14,025	10,370
Architect Supervision	45,000	9,135	7,425	5,490
Insurance	70,000	14,210	11,550	8,540
Subtotal		$ 55,454	$45,073	$33,327
FHA Fees	81,834			
Financing Fee	177,920			
GNMA Fee	71,168			
Legal	25,000			
Organization	30,000			
Cost Certification	9,000			
Contingency Reserve	251,225			
Underwriting Cost	256,235			
Market Discount	244,505			
Under Issuance	41,800			

These costs are attributed to the purchasing of the property and not included an a seismic cost.

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 112 S. Occidental
Owner: D. Vadehra
Contractor: Alpha Construction
Engineer: Joseph Zelner & Associates
CDD Construction
Specialist: Phil Meyerson

II. BUILDING DATA:

No. of stories: 3 Shape: rectangular

No. of units: 27 Total Floor Area: 14,600[3] Sq. Ft.

Special Conditions/Description:
Small gable roof in the front portion of the building which requires slightly higher cost for strengthening. Wall thicknesses are 18" at the first floor and 13" for walls above.

---

3. Square footage measured from plan, excluding basement area.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 236,000

B. Source of Funds

City CDBG	$179,000
City Rental Rehab	$ 16,000
Owner's Contribution and City Tax Exempt Bonds	$211,000
Private Financing	uncertain[4]

Total Funding: $ 406,000[3]

C. Expenditures -

1. Seismic Costs

seismic structural	$ 87,651
seismic architectural	$ 29,907
permits and fees	-----[5]
profit and overhead	-----[6]
performace bond	-----[4]

Seismic Subtotal: $117,558

2. Other Rehab costs:

Other rehab work	$413,394
profit & overhead	-----[7]
other soft costs	$ 33,327

General Subtotal: $446,721

Total Expenditure: $ 564,279

Seismic Structural: $ 6.00 per/sq. ft.

Seismic Architectural: $ 2.05 per/sq. ft.

Total Seismic Cost: $ 8.05 per/sq. ft. $ 4,354 per/unit

Total Cost: $38.64 per/sq. ft. $20,899 per/unit

---

4. We assume private financing was used to cover the rest of cost.

5. Included in other general rehab soft costs.

6. Included in seismic structural.

7. Included in other rehab work.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
Div.		
1 Gen'l Req. (6% of total)	28,775	6,474
4 Masonry		
a) trusses under floor	20,496	20,496
b) trusses in attic	19,171	19,171
Sandblast masonry; rake and point joists	4,404	4,404
Shear wall plywood	-0-	-0-
Paint or seal masonry	16,840	8,420
Install all metal anchors	27,162	27,162
7 Roofing		
Remove existing, apply new roof	9,135	9,135
9 Drywall		
Patch, plaster, close off incinerator, acoustical ceilings, & tex. shear wall draywall	33,925	4,000
9 Repair ceramic tile floors	810	-0-
9 Replace kitchen flooring w/resilient floring	7,897	3,949
9 Painting: patch cracks, paint interior	11,644	5,822
11 Kitchen cabinets & tops	24,639	-0-
12 Carpets	12,830	6,415
13 Special construction	24,850	-0-
15 Plumbing & hot water	89,178	-0-
16 Electrical	60,515	-0-
Overhead and profit (2%)		2,309
Subtotal		115,448
Change Orders:		
# 7 Seismic floor truss	5,936	5,936
#23 Incinerator	3,620	-0-
#33 Revised Struct. Eng. Dtls.	7,539	-0-
#41 Deteriorated Plaster	1,465	-0-
#42 Engineering Change Seismic (1/6 of total for 6 proj.)	5,047	5,047

IV. **BREAKDOWN OF SEISMIC COST:** (cont'd)

Items	Contract Amount	Amount Attributed to Seismic
#43 Credit due to eng. changes (1/6 of total for 6 proj.)	-16,669	-16,667
#44 Mansard roof - seismic	5,485	5,485
C.O. subtotal	$ 12,425	- 199

Summary:

Seismic Structural: $ 87,651

Seismic Architectural: $ 29,907

Seismic Total $ 117,558

All Others $ 413,394

Total Construction Cost $ 530,952[8]

---

8. Total includes change order amount.

V. CONSTRUCTION COST SUMMARY[9]

Div.	Items	
3	Concrete	$ -0-
4	Masonry	95,826
5	Metals	3,375
6	Rough Carpentry	18,985
6	Finish Carpentry	11,113
7	Waterproofing	945
7	Insulation	4,295
7	Roofing	9,135
7	Sheet Metal	1,200
8	Doors	10,289
8	Windows	4,645
8	Glass	-0-
9	Lath and Plaster	-0-
9	Drywall	33,952
9	Tile Work	810
9	Wood Flooring	-0-
9	Acoustical	-0-
9	Resilient Flooring	7,897
10	Painting and Decorating	11,644
11	Specialities	2,406
11	Special Equipment	-0-
11	Cabinets	24,639
11	Appliances	19,737
12	Blinds and Shades, Artwork	3,910
12	Carpets	12,830
13	Special Construction	24,850
14	Elevators	-0-
15	Plumbing and Hot Water	89,178
15	Heat and Ventilation	17,966
15	Air Conditioning	Incl. in No.15
16	Electrical	60,515
2	Site Utilities	-0-
2	Roads and Walks	2,240
2	Site Improvement	5,178
2	Lawns and Planting	2,025
1	General Requirements	28,775
1	Bond Premium ($)	-0-
1	Other Fees	-0-
	Subtotal of Breakdown Items	$ 508,360
	Builders Overhead	$ 10,167
	Builders Profit	$ -0-
	Total of Cost Breakdown (original contract)	$ 518,527
	Subtotal Change Orders[10]	$ 12,425
	Total	$ 530,952

---

9. Taken from cost breakdowns in Community Development Department project files.

10. Change orders added to represent final construction cost.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolts are combined with the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of subfloor. The combined system for the parallel condition consists of bent plate anchor, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work

Approximately 700 sq.ft. of new plywood has been added to the ceiling joist as diaphragm strength under the gable portion of the roof.

Transverse and Longitudinal Brace

Approximately 6 lines of transverse plywood shear walls are added evenly throughout the building. No plywood was added at the third floor. It is assumed that the allowable stress for existing materials was sufficient. Above and below each interor transverse wall, double 2x4's are added in a "K" brace configuration to connect roof to shear wall and to the existing footing. Wood cross braces are added in the attic space in the longitudinal direction.

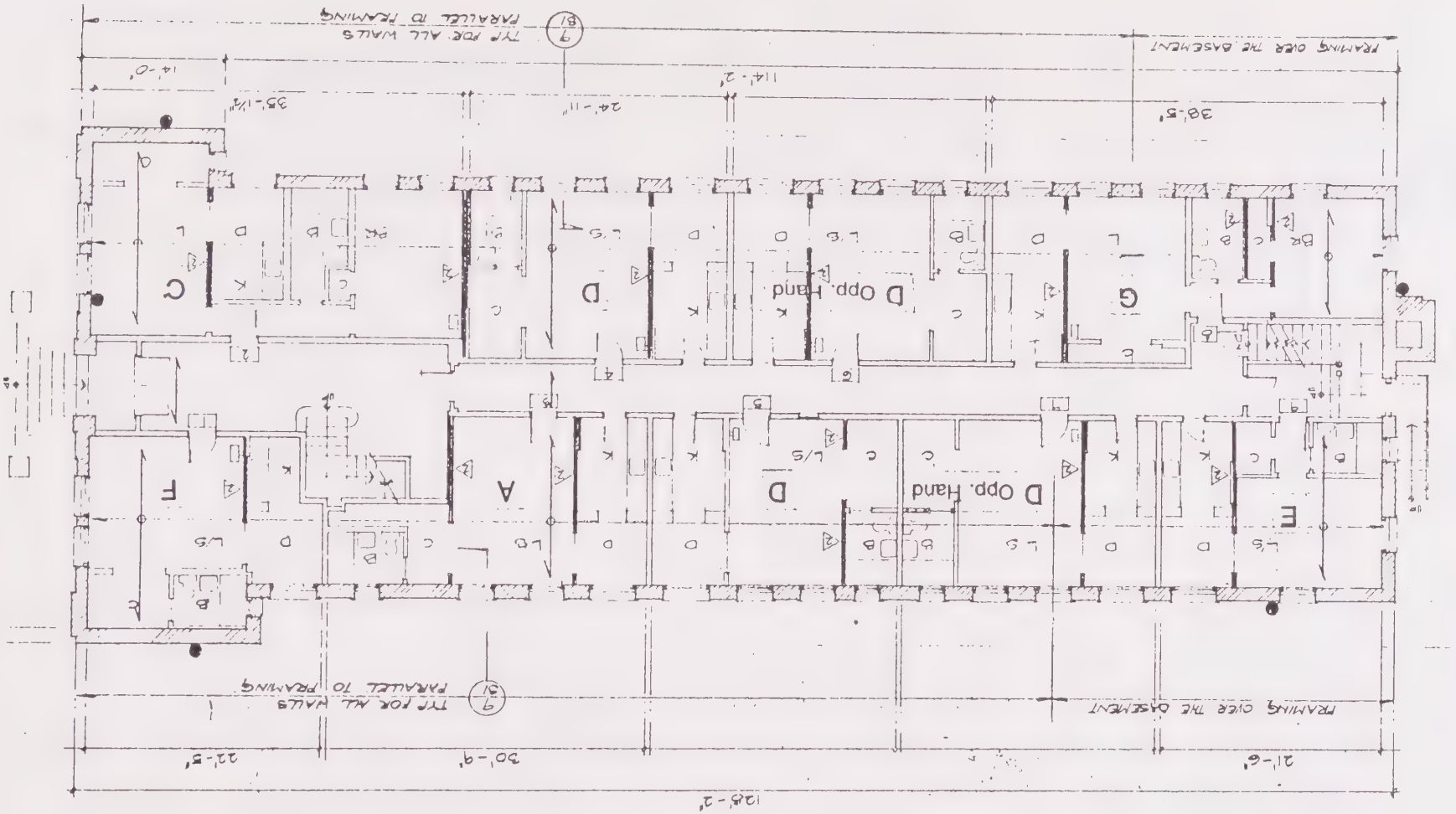
Foundation - None

General:

Interior Partition.....none
Doors and Windows.....major
Wall and Ceiling Surface Repair.....major
Flooring and Carpet.....major
Painting and Decoration.....major
Kitchen and Bath Cabinetry.....major
Kitchen Appliance.....major
Elevator.....none
Plumbing.....major
Kitchen and Bath Fixture.....major
HVAC.....major
Electrical.....major
Site Improvement.....minor
Security System, Intercom.....minor
Dorothy Mae Ordinance.....major

VII. NOTES:

The building was emptied for the reconstruction work.



112 OCCIDENTAL TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

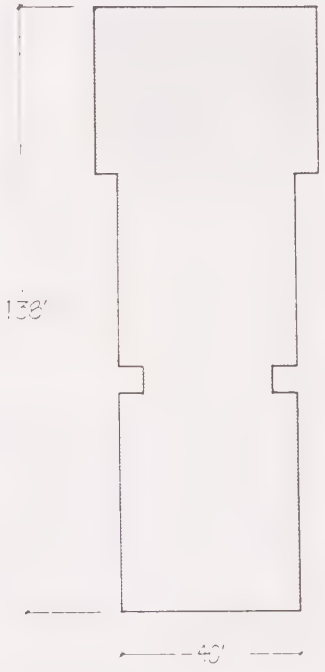
Address: 744 Catalina
Owner: D. Vadehra
Contractor: Alpha Construction
Engineer: Joseph Zelner & Associates
CDD Construction
Specialist: Phil Meyerson

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 40 Total Floor Area: 21,500[1] Sq. Ft.

Special Conditions/Description:
Basement in rear, approximately 1,320 sq.ft. (not included in the above area figure).



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1. Square footage measured from plan, not including basement area.

III.
FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 462,000

B. Source of Funds

City CDBG	$ 280,000
City Rental Rehab	$ 210,000
Owner's Contribution	$ 285,000
Private Financing	uncertain[2]

Total Funding: $ 775,000[2]

C. Expenditures -

1. Seismic Costs

seismic struct & arch	$138,620
permits and fees	-----[3]
profit and overhead	-----[4]
performace bond	-----[3]

Seismic Subtotal: $138,620

2. Other Rehab costs:

Other rehab work	$577,601
profit & overhead	-----[5]
fees, permits and other soft costs	$ 45,073

General Subtotal: $622,674

Total Expenditure: $ 761,294

Total Seismic Cost: $ 6.45 per/sq. ft. $ 3,466 per/unit

Total Cost: $35.41 per/sq. ft. $19,032 per/unit

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2. We assume private finance covers the rest of costs.

3. Included under general soft costs.

4. Included in seismic structural.

5. Included in other rehab work.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
Concrete	15,071	15,071
Masonry	83,329	83,329
Metals	2,750	-0-
Rough Carpentry	26,600	-0-
Roofing	8,079	8,079
Drywall	46,611	4,000
Tilework	1,200	-0-
Resilient Flooring	6,842	3,421
Painting & Decorating	17,250	8,625
Cabinets	38,157	-0-
Carpets	18,819	9,410
Plumbing & Hot Water	127,400	-0-
Electrical	83,730	-0-
GENERAL REQUIREMENTS	38,982	8,400
Overhead and profit (2%)		2,807
Subtotal		140,335
Change Orders		
#37 "Extra Work" Add'l Seismic Engr - Wall Tie Downs	7,098	7,098
#39 Deteriorated Plaster	18,287	-0-
#42 Add'l struct. engr. seismic (1/6 of total)	5,047	5,047
#43 Credit due to Engr. change (1/6 of total)	-16,667	-16,667
Change order subtotal	13,765	- 4,522

Summary:

Seismic Total	$138,620[6]
All Others	$577,601
Total	$716,221

---

6. Structural and architectural costs cannot be separated.

V. CONSTRUCTION COST SUMMARY[7]

Div.	Items	
3	Concrete	$ 1,464
4	Masonry	96,936
5	Metals	2,750
6	Rough Carpentry	26,660
6	Finish Carpentry	15,352
7	Waterproofing	1,400
7	Insulation	5,350
7	Roofing	8,079
7	Sheet Metal	908
8	Doors	17,320
8	Windows	9,390
8	Glass	-0-
9	Lath and Plaster	-0-
9	Drywall	46,611
9	Tilework	1,200
9	Acoustical	-0-
9	Wood Flooring	-0-
9	Resilient Flooring	6,842
10	Painting and Decorating	17,250
11	Specialities	3,420
11	Special Equipment	2,150
11	Cabinets	38,157
11	Appliances	29,320
12	Blinds and Shades, Artwork	5,825
12	Carpets	18,819
13	Special Construction	29,060
14	Elevators	20,000
15	Plumbing and Hot Water	127,400
15	Heat and Ventilation	26,616
15	Air Conditioning	Incl. in No.15
16	Electrical	83,730
2	Site Utilities	-0-
2	Roads and Walks	1,898
2	Site Improvement	5,793
2	Lawns and Planting	-0-
1	General Requirements	38,982
1	Bond Premium	-0-
1	Other Fees	-0-
	Subtotal of Breakdown Items	$ 688,682
	Builders Overhead	$ 13,774
	Builders Profit	$ -0-
	Total of Cost Breakdown Items	$ 702,456
	Total Change Orders[8]	$ 13,765
	Total	$ 716,221

---

7. Taken from cost breakdown in Community Development Department project files.

8. Change orders added to represent final construction cost.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolts are combined with the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of subfloor. The combined system for the parallel condition consists of bent plate anchor, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work - None

Transverse and Longitudinal Brace

Approximately 14 lines of plywood shear panels have been added in the transverse partition walls in the first, second and third floors. Some of these are new partitions while the others are in existing walls. It is assumed that the partitions above the new panels in the fourth floor is sufficient with existing strengthening. Two bays of windows were filled with concrete block in the front facade. Wood bracing has been added at all transverse partitions at attic and crawl space to connect roof and floor diaphragms to foundation. Wood bracing was added in the attic space above the longitudinal corridor walls for the same purpose.

Foundation

A new 1'x 1' grade beam has been added at the basement foundation.

General:

Interior Partition.....minor
Doors and Windows.....major
Wall and Ceiling Surface Repair.....major
Flooring and Carpet.....major
Painting and Decoration.....moderate
Kitchen and Bath Cabinetry.....major
Kitchen Appliance.....major
Elevator.....moderate
Plumbing.....major
Kitchen and Bath Fixture.....minor
HVAC.....major
Electrical.....major
Site Improvement.....minor
Security System, Intercom.....minor
Dorothy Mae Ordinance.....major

VII. NOTES:

An unusually large number of plywood shear panels have been added. The building was emptied during construction.

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

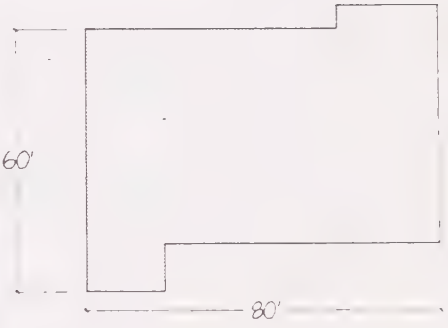
Address: 3075 Harrington
Owner: Vadehra Enterprises, Inc.
Contractor: Alpha Construction
Engineer: Joseph Zelner & Associates
CDD Construction Specialist: Lynne M. Miranda

II. BUILDING DATA:

No. of stories: 3 Shape: rectangular

No. of units: 18 Total Floor Area: 11,500[1] Sq. Ft.

Special Conditions/Description:
Small basement in the rear of building.



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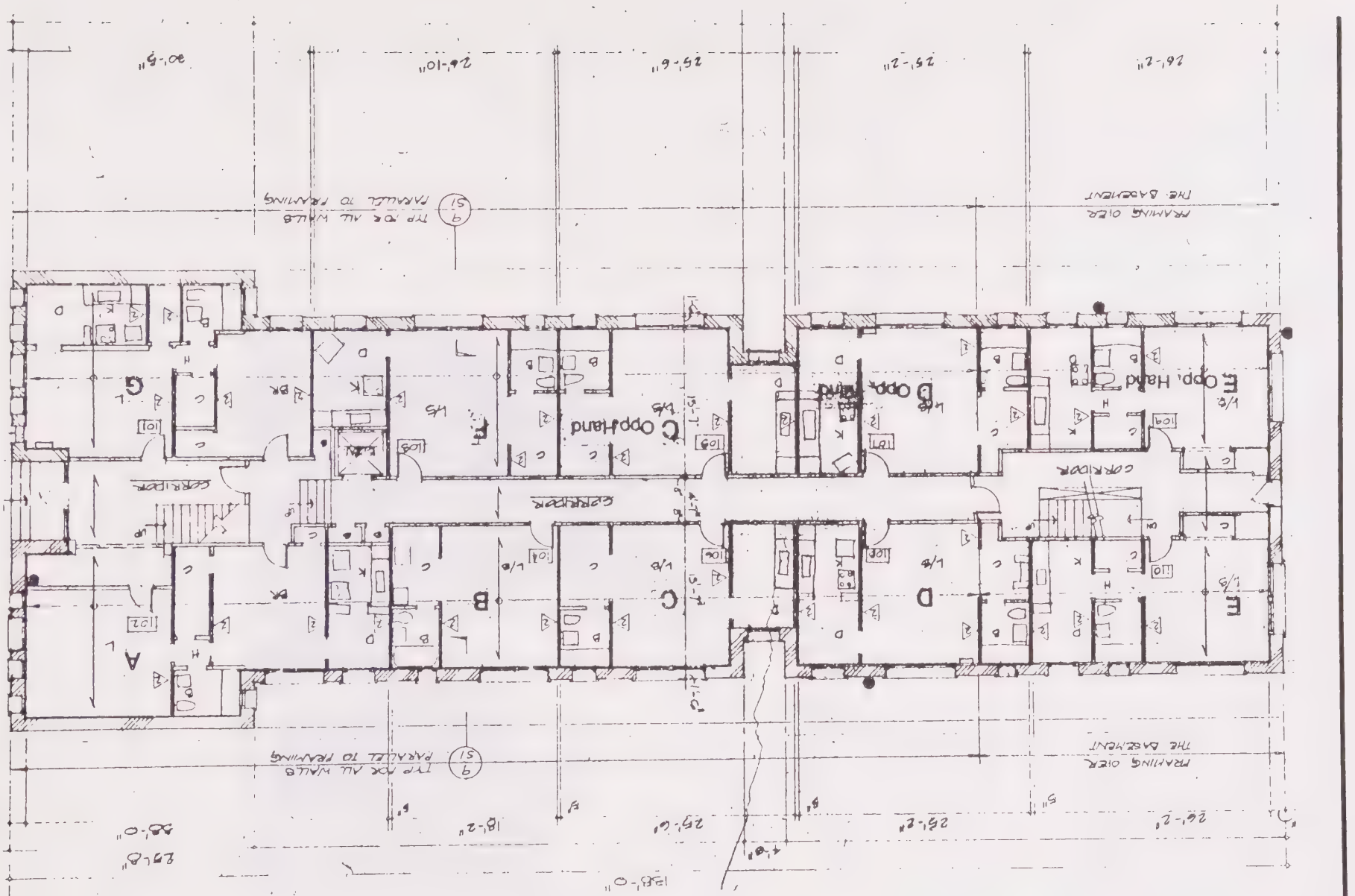
1. Square footage and number of units measured from plan, not including basement area (approx. 500 sq. ft.).



744 CATALINA TYPICAL PLAN

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 181,000

B. Source of Funds

CDD Grant	$ 120,000
CDBG Deferred Loan	$ 21,000
Private Lender	$ 109,826

Total Funding: $ 250,826[2]

C. Expenditures -

1. Seismic Costs

seismic	$ 128,606[3]
permits and fees	-----[4]
profit and overhead	-----[4]
performace bond	-----[4]

Seismic Subtotal: $ 128,606

2. Other Rehab costs:

Other rehab work	$ 104,203
fees, permits, profit,	-----[5]
overhead and bond	-----[5]

General Subtotal: $ 104,203

Total Expenditure: $ 232,809

Total Seismic Cost: $11.18 per/sq. ft. $ 7,145 per/unit

Total Cost: $20.24 per/sq. ft. $12,934 per/unit

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2. Contingency amount not expended applied to repayment of loan.

3. Seismic structural and architectural cost cannot be separated.

4. Included in seismic costs.

5. Included in other rehab cost.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
I. Seismic	$ 83,076	$ 83,076
III.#2 Debris Removal	1,200	1,200
IV. 2. Remove & repair roof	13,500	13,500
5. Close chimney	200	200
11. Repairs for trades	1,055	528
V. 3. Paint hallways and other public areas	2,400	1,200
VIII.		
13. New kitchen vinyl tile floor	2,250	1,125
14. New carpet and pad	3,510	1,755
17. Paint all unit interiors	4,555	2,278
Subtotal		$ 104,662
Overhead and profit (20%)		$ 20,932
Performance and payment bond (2%)		$ 2,512
Construction permits	1,000	500

No record for change orders

Summary:

Seismic Total	$ 128,606
All Others	$ 104,203
Total	$ 232,809

V. CONSTRUCTION COST SUMMARY[6]

Earthquake Reinforcement	$ 83,076.00
Dorothy Mae Orindance	$ 18,000.00
Building Exterior	$ 25,210.00
Building Common Areas	$ 9,115.00
Elevator - Consolidated	$ N/A
Termite Related construction Work as Per Request	$ -0-
Interior Common to all Apartments	$ 46,496.00
Specific to all Apartments #35 and 41	$ 4,450.00
Pacific Energy (Solar)	$ 1,190.00
Other (specify) yard and sets	$ 1,850.00
Construction Subtotal	$ 189,387.00
Contractor's Overhead & Profit (20%)	$ 37,877.00
Construction Total	$ 227,264.00
100% Performance & 50% payment Bond (2%)	$ 4,545.00
All Construction Permits	$ 1,000.00
Termite Treatment	N/A
Other (specify)	-0-
Grand Total	$ 232,809.00

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6. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchors and shear bolting are combined by the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of sub floor. The combined system for the parallel condition consists of bent plate anchors, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work

None

Transverse and Longitudinal Brace

Approximately 3 lines of plywood shear panels have been added at the first floor only. It is assumed that the partitions above the new shear panels are sufficient with existing strengtheners. Wood bracing has been added at all transverse partition walls at attic and crawl space to connect roof and floor diaphragms to foundation. Wood bracing added in the attic space of the longitudinal corridor walls for the same purpose.

Foundation

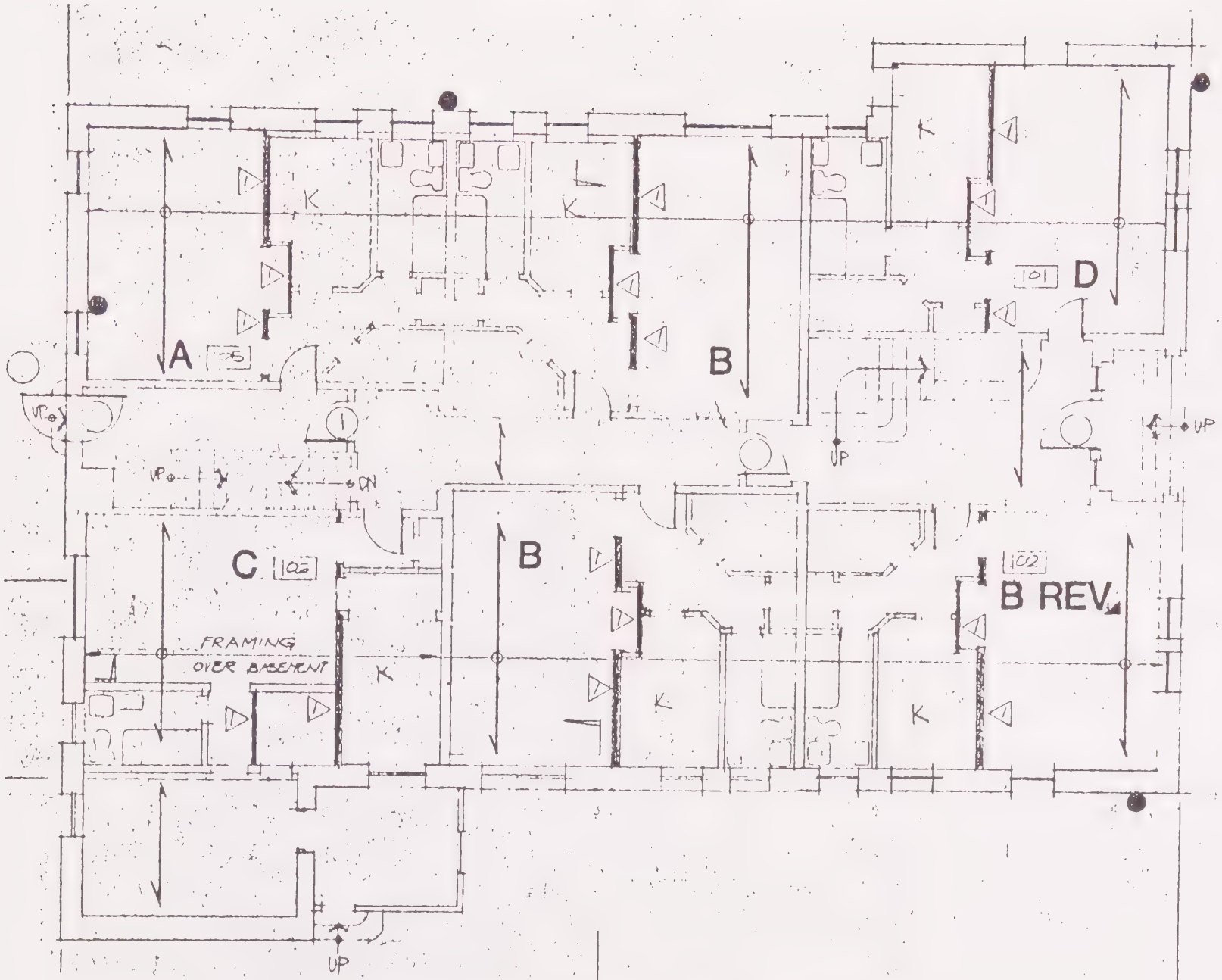
None.

General:

Interior Partition	none
Doors and Windows	minor
Wall and Ceiling Surface Repair	minor
Flooring and Carpet	moderate
Painting and Decoration	moderate
Kitchen and Bath Cabinetry	minor
Kitchen Appliance	none
Elevator	none
Plumbing	minor
Kitchen and Bath Fixture	minor
HVAC	moderate
Electrical	moderate
Site Improvement	minor
Security System, Intercom	minor
Dorothy Mae Ordinance	major

VII. NOTES:

Construction was done with tenants in place.



3075 HARRINGTON TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 3051 Leeward
Owner: D. Vadehra
Contractor: Alpha Construction
Engineer: Joseph Zelner & Associates
CDD Construction Specialist: Phil Meyerson

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 47 Total Floor Area: 21,000[1] Sq. Ft.

Special Conditions/Description:
Drawings not available, special conditions unknown.

---

1. Number of units and square footage cannot be verified since drawings are not available.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ Unknown

B. Source of Funds

City CDBG	$ 329,000
City Rental Rehab	$ 329,000
Private Funds	$ 125,863

Total Funding: $ 783,863[2]

C. Expenditures -

1. Seismic Costs

seismic structural	$ 173,269
seismic architectural	$ 74,714
permits and fees	-----[3]
profit and overhead	-----[4]
performace bond	-----[5]

Seismic Subtotal: $ 247,983

2. Other Rehab costs:

Other rehab work	$ 666,326
profit & overhead	-----[6]
other soft costs	$ 55,454

General Subtotal: $ 721,780

Total Expenditure: $ 969,763

Seismic Structural: $ 8.25 per/sq. ft.

Seismic Architectural: $ 3.56 per/sq. ft.

Total Seismic Cost: **$11.80 per/sq. ft. $ 5,276 per/unit**

Total Cost: **$46.18 per/sq. ft. $20,633 per/unit**

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2. Funding amount as recoreded by CDD does not match construction loan amount.

3. Included in 6% general requirements.

4. Included in seismic strucutral.

5. Soft cost include soft cost for seismic work.

6. Included in other rehab work.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
General Requirement	48,129	12,032
Div 3 - Concrete	34,724	34,724
Div 4 - Masonry		
Trusses	35,092	35,092
Sandblast and paint	5,472	5,472
Plywood shear wall	11,400	11,400
Paint and seal	21,742	21,742
Anchors	59,410	59,410
Div 5 -		
Div 6 -		
Int. partition & flr patch. patch roof sheeting	4,160	-0-
Div 7 -		
Remove and reroof	7,562	7,562
Div 9 -		
Patch plaster from trades	27,460	6,865
Acoust. ceiling & texture shear walls	17,819	8,910
Replace ceramic tile	1,410	-0-
Replace kitchen floor	3,035	1,518
Paint building interior	20,066	10,033
Div 12 -		
Carpet	18,549	9,275
Div 13 -		
Plaster demot for trades	29,375	7,344
Div 15 -		
Ro & fin. plumbing	100,168	-0-
Tub Surrounds	4,348	-0-
Div 16 -		
Ro & fin. electrical	73,988	-0-
Subtotal		231,379
Overhead and profit (2%)		4,628

IV. **BREAKDOWN OF SEISMIC COST:** (cont.)

Items		Contract Amount	Amount Attributed to Seismic
Change Orders			
# 5	Seismic floor truss	4,030	4,030
#27	Seismic	-0-	-0-
#20	Seismic hold-dwn & straps	16,446	16,446
#28	Filling of ext. cracks	3,120	3,120
# 6	Deteriorated plaster	22,439	-0-
# 8	?	1,609	-0-
#10	Original struct. defic.	300	-0-
#12	Rewire phone	1,880	-0-
#15	Deteriorated plster	1,350	-0-
#18	Fire damage	2,200	-0-
#17	Dry rot	3,216	-0-
#19	Dry rot	2,055	-0-
#42	Add'l eng. seismic (1/6 of total)	5,047	5,047
#43	Credit due to eng. change (1/6 of total)	-16,667	-16,667
	Subtotal	47,025	11,976

Summary:

Seismic Structural: $ 173,269

Seismic Architectural: $ 74,714

Seismic Total $ 247,983

All Others $ 666,326

Total $ 914,309[7]

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7. Total includes contract amount plus change orders.

V. CONSTRUCTION COST SUMMARY[8]

Div.	Items	
3	Concrete	$ 67,716
4	Masonry	100,124
5	Metals	4,470
6	Rough Carpentry	34,981
6	Finish Carpentry	21,734
7	Waterproofing	1,645
7	Insulation	4,955
7	Roofing	7,658
7	Sheet Metal	930
8	Doors	25,834
8	Windows	8,140
8	Glass	-0-
9	Lath and Plaster	-0-
9	Drywall	45,279
9	Tile Work	1,410
9	Acoustical	-0-
9	Wood Flooring	-0-
9	Resilient Flooring	4,735
10	Painting and Decorating	20,269
11	Specialities	3,966
11	Special Equipment	-0-
11	Cabinets	55,855
11	Appliances	34,357
12	Blinds and Shades, Artwork	6,790
12	Carpets	18,549
13	Special Construction	33,625
14	Elevators	20,000
15	Plumbing and Hot Water	145,105
15	Heat and Ventilation	31,274
15	Air Conditioning	Incl. in No.15
16	Electrical	92,675
	Accessory Buildings	-0-
2	Earth Work	-0-
2	Site Utilities	-0-
2	Roads and Walks	2,684
2	Site Improvement	3,864
2	Lawns and Planting	3,525
2	Unusual Site Conditions	-0-
1	General Requirements	48,129
1	Bond Premium ($)	-0-
1	Other Fees	-0-
	Builders Overhead	17,006
	Builders Profit	-0-
	Total of Cost Breakdown Items	$ 867,284
	Total Change Orders	$ 47,025
	Total	$ 914,309[9]

---

8. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Drawings are not available. Retrofit assumed to be standard Div. 88 method using plywood shear walls.

General:

Interior Partition.....major
Doors and Windows.....major
Wall and Ceiling Surface Repair.....major
Flooring and Carpet.....minor
Painting and Decoration.....major
Kitchen and Bath Cabinetry.....major
Kitchen Appliance.....major
Elevator.....major
Plumbing.....major
Kitchen and Bath Fixture.....minor
HVAC.....major
Electrical.....major
Site Improvement.....minor
Security System, Intercom.....major
Dorothy Mae Ordinance.....major

---

9. Change order amount added to represent final construction cost.

Notes on the Scenic Site Buildings:

The following buildings are rehabilitated by the Scenic Sites Development Company:

1845 N. Gramery
2016 W. Adams
2022 W. Adams
715 S. St. Andrews

The CDD record on these buildings is very poor, and it is difficult to reconstruct the exact expenditure. As an example, the record shows a discrepancy between the amount allocated to these projects and the amount accountable by dispersements (see attached). The record does not show the breakdown for soft costs, nor does it indicate whether or not the contingency reserve has been used at the end of the project. For the calculation of cost, it has been assumed that the contingency reserve has been completely used and thus the total expenditure is the same as the amount funded. Because of the uncertainties, the actual cost could be substantially lower.

These contracts are written so that the change orders during construction are absorbed without significant cost changes in the original contract. Therefore, some items of the contract are deleted to pay for the "extras". Different from change orders, the extras will have overhead, profit and other percentage charges added. The entire scope of work thus may be different from the original contract. This cost study is based on the construction summary compiled after completion (except for the case of 2022 W. Adams where no such record was found).

The construction breakdown submitted by Scenic Sites indicates that their definition of seismic cost is different from ours. They tend to attribute much more cosmetic work to seismic architectural cost than other buildings in this study. Although this may be due to the level of architectural finish desired by the developer, this discrepancy should be noted when interpreting the cost findings.

ALLOCATED REHAB VS SCENIC SITES PROOF CONTRACT OF PAYMENT[1]

Hobart Villas:	
Construction Contract Amount	$ 478,305.00
Check Total	467,683.00
Discrepancy	$ 10,622.00
Wilshire Villas South:	
Construction Contract Amount	$ 1,074,284.00
Check Total	826,068.00
Discrepancy	$ 248,216.00
Gramercy Park Villas:	
Construction Contract AMoun	$ 488,435.00
Check Total	431,646.00
Discrepancy	$ 56,789.00
Chateau Adams:	
Construction Contract Amount	$ 884,794.00
Check Total	527,540.00
Discrepancy	$ 357,254.00
Total Discrepancy	$ 672,881.00

---

1. Taken from a Community Development Department internal memorandum.

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 1845 N. Gramercy
Owner: Scenic Sites
Contractor: Saunders Construction
Engineer: Joseph Zelner and Assoc.
CDD Construction
Specialist: Reginald Nisby

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 48 Total Floor Area: 23,500 [2] Sq. Ft.

Special Conditions/Description:
Long and narrow building.

---

2. Measured from plan, not including basement (approx. 700 sq.ft.).

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 160,000

B. Source of Funds

CDBG Deferred Loan	$ 258,960
City Rehab Grant	$ 66,228
Private Funds	$ 223,409

Total Funding: $ 548,597[3]

C. Expenditures -

1. Seismic Costs

seismic structural	$196,342
seismic architectural	$ 75,779
permits and fees	-----[4]
profit and overhead	-----[4]
performace bond	-----[4]

Seismic Subtotal: $ 272,121

2. Other Rehab costs:

Other rehab work	$ 203,120
fees, permits, profit, overhead and bond	included
other soft costs	$ 27,320

General Subtotal: $ 230,440

Total Expenditure: $ 502,561

Seismic Structural: $ 8.35 per/sq. ft.

Seismic Architectural: $ 3.22 per/sq. ft.

Total Seismic Cost: $11.58 per/sq. ft. $ 5,669 per/unit

Total Cost: $21.39 per/sq. ft. $10,470 per/unit

---

3. Contingency amount not expended applied to repayment of loan.

4. Included in seismic structural.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Seismic: Per plans and Div 88	143,554	143,554
4. Electrical Work	41,727	-0-
5. Painting		
Interior	27,500	13,750
Exterior	8,260	-0-
6. Flooring		
New linoleum in kitchen	10,360	5,180
Carpet & pad existing units and halls	21,000	10,500
10. Plastering/Drywall patching		
Repair & replace plaster in hallways & units w/drywall	1,536	-0-
seismic plastering	33,719	33,719
11. Tile Work		
Repair/replace kitchen bath tiles	10,464	-0-
Caulking	2,400	-0-
14. Plumbing	2,400	-0-
17. Carpenting	3,600	-0-
41. Roofing		
Repair/replace as needed	15,384	15,384
Extras:		
A3. Shear walls tie-ins	4,680	4,680
A5. Plaster/Drywall	8,802	-0-
Subtotal		$ 226,767
Overhead and profit (20%)		$ 45,354

Summary:

Seismic Structural: $ 196,342

Seismic Architectural: $ 75,779

Seismic Total $ 272,121

All Others $ 203,120

Total $ 475,241

V. CONSTRUCTION COST SUMMARY[5]

Items		Cost
Seismic		$ 143,554.00
Fire Alarms		2,500.00
Security Systems		1,745.00
Electrical		41,727.84
Painting		35,760.00
Flooring (Carpet/Vinyl)		31,359.84
Entry Doors		9,696.00
Exterior General Repair		3,520.00
Interior Reparit		1,630.08
Plastering/Drywall Patch		35,255.00
Tile Work/Tubs		21,264.00
Windows		7,200.00
Screens		2,400.00
Plumbing		2,400.00
Window Shades		6,720.00
Appliances		2,400.00
Carpentry		3,600.00
	Subtotal	$ 352,731.76
	Contractor's Profit and Overhead	70,546.35
	Subtotal	$ 423,278.11
Extras:		
Roof		15,384.00
Door Jambs		4,771.00
Shear Wall Tie-Ins		4,680.00
Bath Detail		5,025.60
Plastering/Drywall		8,802.00
Tub Kits		9,300.00
Intercom		4,000.00
	Subtotal	51,962.60
	Total Construction Cost	$ 475,240.71
Interest		27,320.00
	Total	$ 502,560.77

---

5. Taken from cost breakdown in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchors and shear bolts are combined with the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of sub floor. The combined system for the parallel condition consists of bent plate anchor, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work

None

Transverse and Longitudinal Brace

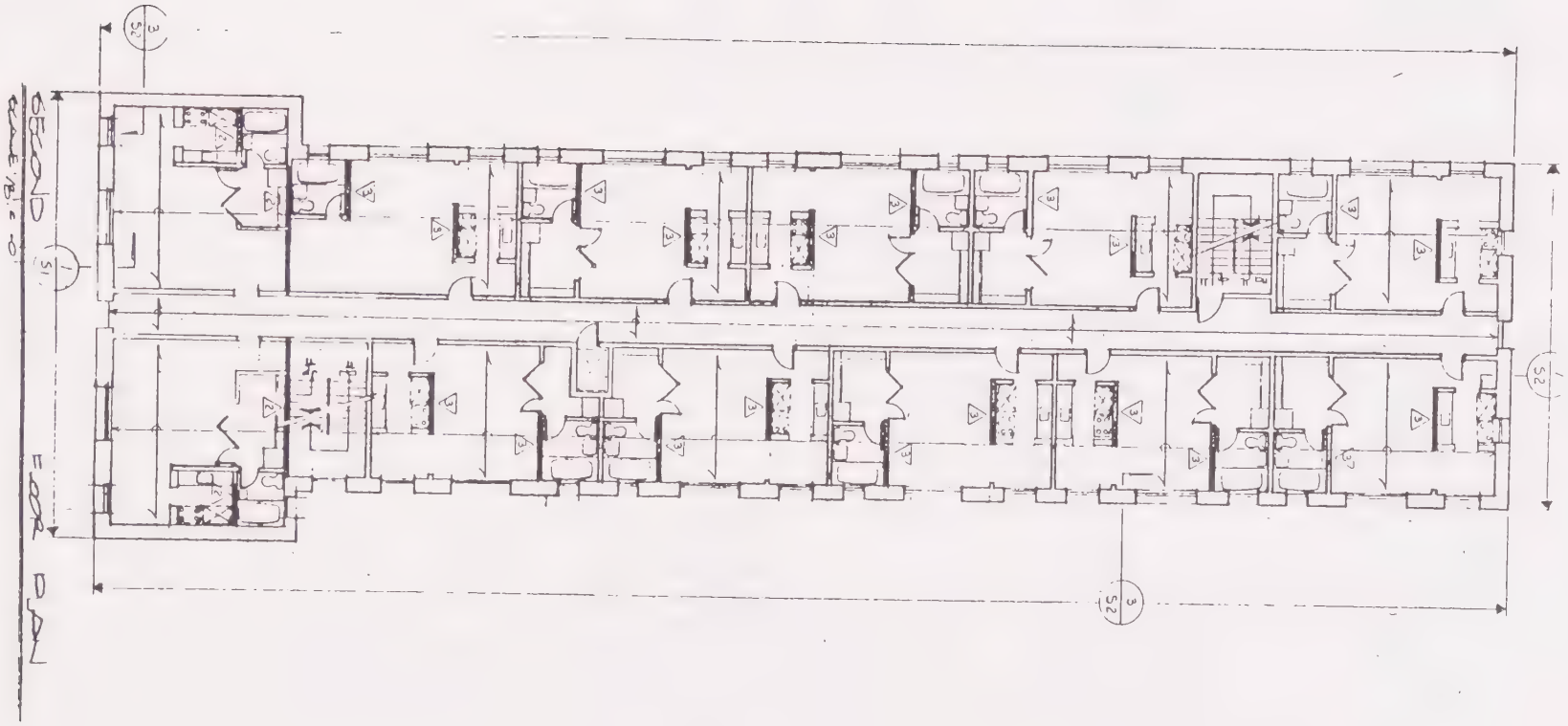
Approximately 11 lines of transverse plywood shear wall have been added at the first, second and third floors. Standard connections above and below all partitions.

Foundation

None

General:

Interior Partition.....none
Doors and Windows.....minor
Wall and Ceiling Surface Repair.....major
Flooring and Carpet.....major
Painting and Decoration.....major
Kitchen and Bath Cabinetry.....minor
Kitchen Appliance.....minor
Elevator.....minor
Plumbing.....minor
Kitchen and Bath Fixture.....moderate
HVAC.....none
Electrical.....major
Site Improvement.....none
Security System, Intercom.....major
Dorothy Mae Ordinance.....major



1845 N. GRAMERCY TYPICAL PLAN

Notes for 2016/2022 W. Adams:

These two adjacent structures were retrofitted at the same time and financed as a package. The structural properties of the two buildings are similar, both are slightly irregularly shaped buildings of late vintage URM with concrete bond beams. Their design is not typical of URM's as one has narrow and tall windows and the other has a curved corner. The construction time for the two buildings is 9 months.

Records from the Community Development Department for these buildings are poor. The source of funding information here is based on a computer summary sheet generated by the field office. Since the buildings are funded together as a package, the joint funds, contingency and soft costs are divided proportionately here according to their construction values for the purpose of general comparison of unit cost. The distribution is summarized in the following table.

	2016 W. Adams 44%	2022 W. Adams 56%	Total 100%
Contract Amount	391,000	494,000	885,000
Funds:			
CDBG Deferred Loan	254,000	323,000	577,541
Rental Rehab Grant	44,000	56,000	100,300
Private Funds	113,000	144,000	256,887
Contingency & Soft Costs	22,000	28,000	49,754

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 2016 W. Adams
Owner: Scenic Sites Management Co., Inc.
Contractor: Saunders Construction
Engineer: Zelner & Associates
CDD Construction
Specialist: various

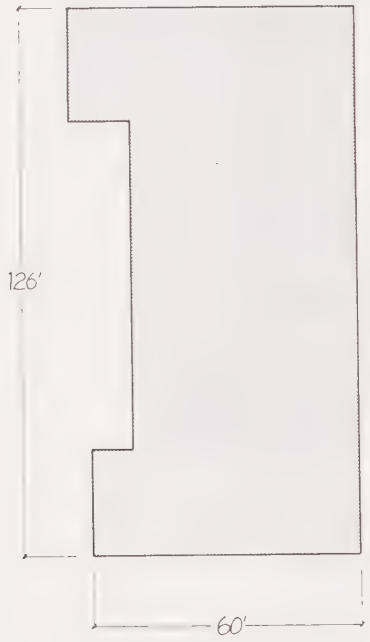
II. BUILDING DATA:

No. of stories: 4 Shape: irregular

No. of units: 35 Total Floor Area: 26,622[1] Sq. Ft.

Special Conditions/Description:
See notes at the beginning of case study

[See photo of 2022 W. Adams.]



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1. Square footage measured from plan.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 55,000[2]

B. Source of Funds

CDBG Deferred Loan	$254,000
City Rehab Grant	$ 44,000
Private Funds	$113,000

Total Funding: $ 411,000

C. Expenditures -

1. Seismic Costs

seismic structural	$178,480
seismic architectural	$ 71,424
permits and fees	-----[3]
profit and overhead	-----[3]
performace bond	-----[3]

Seismic Subtotal: $249,904

2. Other Rehab costs:

Other rehab work	$157,242
fees, permits, profit, overhead and bond	-----[4]
interest	$ 20,789

General Subtotal: $178,031

Total Expenditure: $ 427,935

Seismic Structural: $ 6.70 per/sq. ft.

Seismic Architectural: $ 2.68 per/sq. ft.

Total Seismic Cost: $ 9.39 per/sq. ft. $ 7,140 per/unit

Total Cost: $16.07 per/sq. ft. $12,227 per/unit

---

2. Permit valuation is also divided by construction cost ratio.

3. Permit and fees included under 20% (P&O, General Requirement).

4. Included in other rehab work.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Seismic: Per plans and Div 88	116,624	111,624
6. Electrical Work	24,878	-0-
7. Painting		
Interior	20,900	10,450
Exterior	10,130	-0-
8. Flooring	26,954	13,477
14. Plastering		
Repair	4,625	-0-
Seismic	29,743	29,743
15. Tile Work	1,850	-0-
18. Plumbing		
Replace	3,515	-0-
Gas	1,850	-0-
24. Carpeting	2,775	-0-
25. Roofing	2,200	2,200
26. Miscellaneous Ro Cleaning	1,850	925
Final cleaning	1,850	925
Remove carpet	2,600	1,800
Subtotal		$ 171,144
Overhead and profit (20%)		$ 34,229

IV. BREAKDOWN OF SEISMIC COST: (cont'd)

Items	Contract Amount	Amount Attributed to Seismic
Extras:		
Roof (Seismic)	27,894	27,894
Electric	6,509	-0-
Door Stops	591	-0-
Door Jambs	240	-0-
Shear Wall Tie-Ins	3,120	3,120
Bath Detail	6,697	-0-
Seismic	5,868	5,868
Tub Kits	7,500	-0-
Anchor Bolts	7,650	7,650
Subtotal	$ 66,069	$ 44,532
Overhead and profit (20%)		$8,906
Total		$ 258,811

Summary:

Seismic Structural: $ 187,387

Seismic Architectural: $ 71,424

Seismic Total	$ 258,811
All Others	$ 148,335
Total[5]	$ 407,146

---

5. Total include extras, but excludes interest cost.

V. CONSTRUCTION COST SUMMARY[6]

Items	
Seismic	$ 111,624.10
Fire Alarms	4,350.09
Security Systems	1,648.72
Electrical	24,878.06
Painting	31,030.05
Flooring (Carpet/Vinyl)	26,954.87
Entry Doors	7,474.00
Exterior General Repair	4,921.00
Interior Reparit	5,901.13
Plastering/Drywall Patch	35,292.82
Tile Work	1,850.00
Windows	4,625.00
Screens	1,999.85
Plumbing	5,365.00
Window Shades	5,886.00
Wall Heaters	1,295.00
Appliances	4,200.00
Carpentry	2,775.00
Roofing	2,200.02
Subtotal	$ 284,230.71
Contractor's Profit and Overhead	56,846.14
Subtotal	$ 341,076.85
Extras:	
Roof (Seismic)	27,893.93
Electric	6,508.67
Door Stops	590.92
Door Jambs	240.13
Shear Wall Tie-Ins	3,119.84
Bath Details	6,697.00
Seismic	5,867.83
Tub Kits	7,499.90
Anchor Bolts	7,650.12
Interest	20,789.93
Total	$ 427,935.12

---

6. Taken form cost breakdown in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Structural drawings not available - retrofit design unknown

General:

Windows	minor
Wall and Ceiling repair	moderate
Flooring and Carpet	major
Painting	major
Kitchen and Bath Cabinetry	minor
Elevators	minor
Plumbing	minor
Kitchen Fixture	minor
HVAC	minor
Electrical	major
Site Improvement	none
Security System, Intercom	major
Dorothy Mae Ordinance	major

III. **FINANCIAL SUMMARY:**

A. Building and Safety Permit Valuation $ 70,000[2]

B. Source of Funds

CDBG Deferred Loan	$323,000
City Rehab Grant	$ 56,000
Private Funds	$144,000

Total Funding: $ 523,000

C. Expenditures -

1. Seismic Costs

seismic structural	$127,148
seismic architectural	$ 71,329
permits, profit, overhead and performace bond	-----[3]

Seismic Subtotal: $198,477

2. Other Rehab costs:

Other rehab work	$300,733
fees, permits, profits, overhead and bond	-----[3]
other soft costs	-----[3]
contingency reserve	$ 28,000

General Subtotal: uncertain[4]

Total Expenditure: $ 523,000[4]

Seismic Structural: $ 4.01 per/sq. ft.

Seismic Architectural: $ 2.25 per/sq. ft.

Total Seismic Cost: $ 6.26 per/sq. ft. $ 5,223 per/unit

Total Cost: $16.51 per/sq. ft. $13,763 per/unit

---

2. Permit valuation is distributed by construction cost ratio of the two buildings.

3. These items are included in 20% general requirements.

4. Record does not indicate contruction loan interest, nor if all contingency reserves are used. Record also does not indicate change orders. We assume that all of the contingency is used.

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address: 2022 W. Adams
Owner: Scenic Sites
Contractor: Saunders Construction
Engineer: Zelner & Associates
CDD Construction
Specialist: various

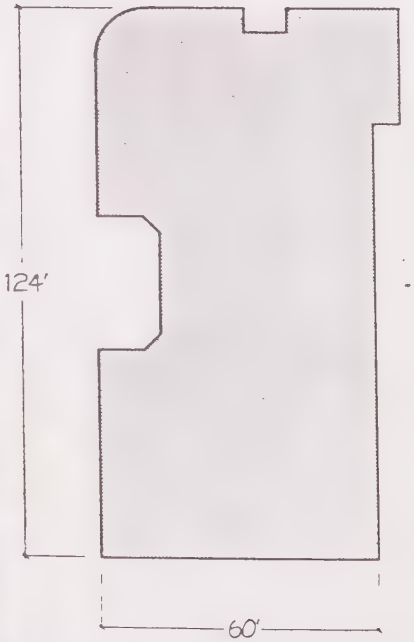
II. BUILDING DATA:

No. of stories: 5 Shape: irregular

No. of units: 38 Total Floor Area: 31,670[1] Sq. Ft.

Special Conditions/Description:
See notes at beginning of 2016 W. Adams case study.

Building steps down the hill and has storage space at a part of the first floor.



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1. Square footage is measured from plan, not including 1,440 sq. ft. of storage space on the first floor.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Seismic: Per plans and Div 88	94,965	94,965
6. Electrical Work		
7. Painting		
Interior	25,000[5]	12,500
Exterior	6,140[5]	-0-
8. Flooring		
New linoleum in kitchens	9,120	4,560
Carpet units and halls	21,000	10,500
14. Plastering/Drywall Patching		
Repair/replace plaster in hallway and units	9,766	-0-
Seismic plastering	31,331[5]	31,331
15. Tile Work		
Kitchen/bath units	4,180	-0-
Caulking	1,900	
18. Plumbing	11,780	-0-
24. Carpentry		
Tub surrounds	9,500	-0-
25. Roofing - repair/replace as needed	10,992	10,992
26. Miscellaneous		
Rough cleaning	2,850	855
Final cleaning	2,850	855
Remove carpet	4,500	1,350
Subtotal		$ 167,908
Overhead and profit (20%)		$33,582

Seismic Change Orders

#07A: Interior painting: cost increase $ 3,000
#07B: Exterior painting: cost decrease $ 3,000
#14E: Seismic plastering: cost increase $ 4,991

---

5. These changes in cost are already accounted for in the above costs.

IV. BREAKDOWN OF SEISMIC COST: (cont'd)

Summary:

Seismic Structural:	$127,148
Seismic Architectural:	$ 71,329
Seismic Total:	$ 198,477
All Others:	$ 300,733
Total[6]:	$ 499,210

---

6. Total includes change orders.

V. CONSTRUCTION COST SUMMARY[7]

Items	Cost
Seismic	$ 97,965
Fire Alarm System	6,345
Sprinkler System	24,300
Elevator Maintenance	2,500
Electrical	37,903
Painting	31,140
Flooring	30,120
Entry Dors	8,888
Exterior General Repairs	8,230
Interior General Repairs	7,425
Mailboxes	1,216
Plaster/Drywall Patching	51,556
Tile Work	6,080
Windows	5,700
Screens	836
Plumbing	11,780
Window Shades	5,320
Wall Heaters	1,917
Appliances	4,560
Sinks and Tubs	8,930
Carpentry, General Repairs	23,142
Roofing	10,992
Miscellaneous	$ 10,200
Subtotal	$ 430,240
Profit & Overhead, 20%, including General Requirements	$ 80,648
Bonding 2% ($483,888)	$ 9,678
Termite Work Per Termite Report	$ 653
GRAND TOTAL	$ 494,219

---

7. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolts are combined with the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of subfloor. The combined system for the parallel condition consists of bent plate anchor, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work

None

Transverse and Longitudinal Brace

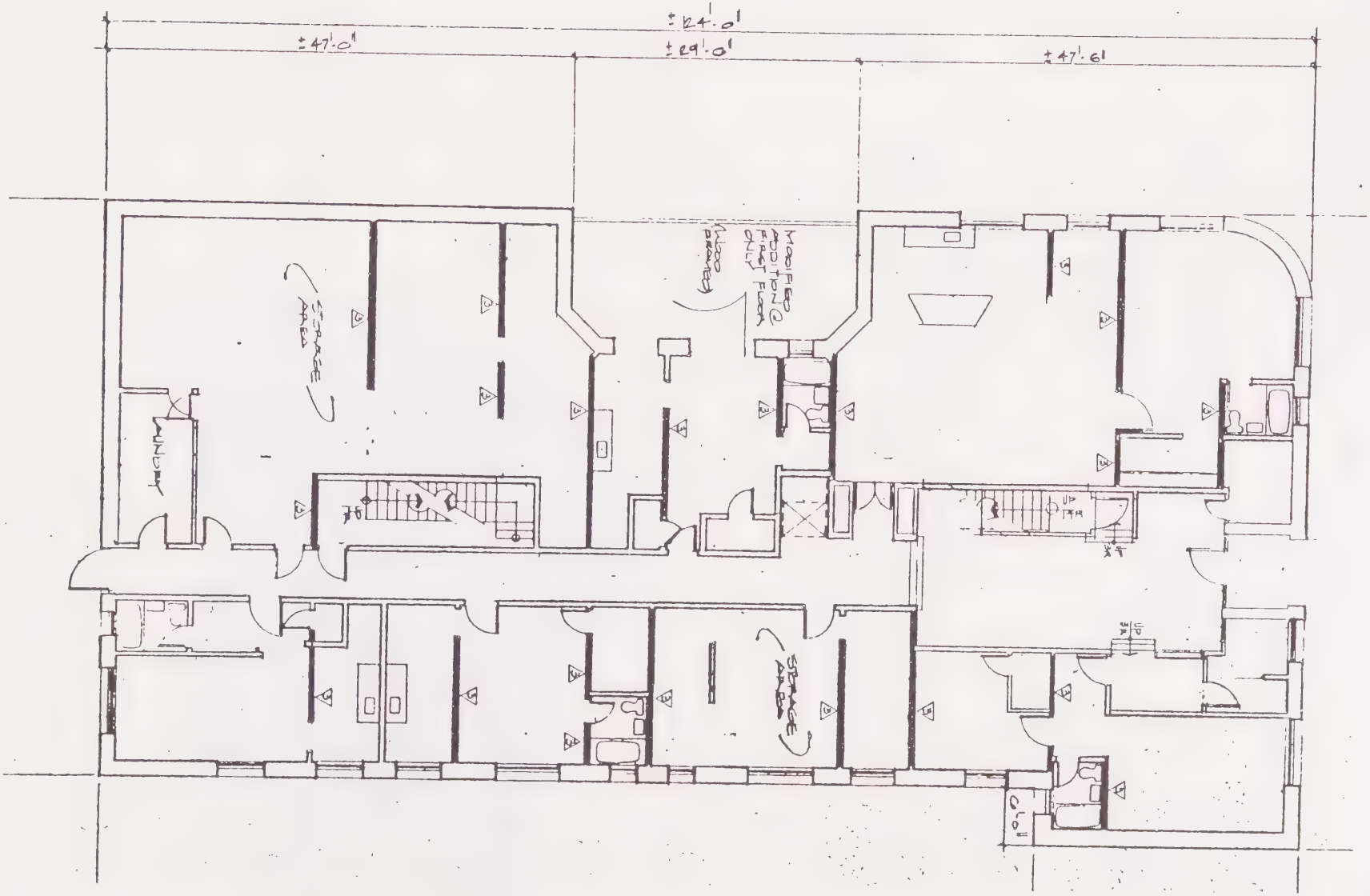
Approximately 8 lines of plywood shear wall have been added on the first, second and third floors.

Foundation

None

General:

Interior partitions	none
Windows	minor
Wall and Ceiling Surface Repair	moderate
Flooring and Carpet	major
Painting and Decoration	major
Kitchen and Bath Cabinetry	moderate
Kitchen Appliance	minor
Elevator	minor
Plumbing	minor
Kitchen and Bath Fixture	minor
HVAC	minor
Electrical	major
Site Improvement	none
Security System, Intercom	major
Dorothy Mae Ordinance	major



2022 W. ADAMS TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

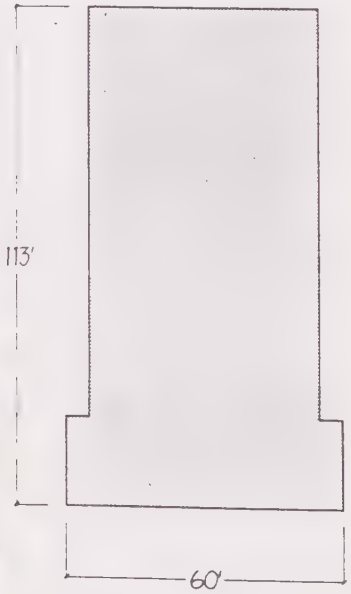
Address: 715 St. Andrews Place
Owner: Scenic Sites Management Co., Inc.
Contractor: Saunders Construction
Engineer: Joseph Zelner & Assoc.
CDD Construction Specialist: various

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 44 Total Floor Area: 21,340 Sq. Ft.

Special Conditions/Description:
Basement at the rear of building.



III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $60,000

B. Source of Funds

City CDBG	$ 325,982
City Rental Rehab	$ 58,819
Private Owner	?
Private Lender	?
Other Tax Exempt Bonds	$ 87,331

Total Funding: $ 472,132

C. Expenditures -

1. Seismic Costs

seismic structural	$ 175,162
seismic architectural	$ 99,909
permits and fees	-----[1]
profit and overhead	-----[1]
performace bond (2%)	$ 5,501

Seismic Subtotal: $280,572

2. Other Rehab costs:

Other rehab work	$ 176,242
fees, permits, profit, overhead and bond (20%)	$ 3,525

General Subtotal: $179,767

Total Expenditure: $ 460,339[2]

Seismic Structural: $ 8.37 per/sq. ft.

Seismic Architectural: $ 4.77 per/sq. ft.

Total Seismic Cost: $13.15 per/sq. ft. $ 6,377 per/unit

Total Cost: $21.57 per/sq. ft. $10,462 per/unit

---

1. These items are included in 20% general requirements.

2. Contingency amount not expended applied to repayment of loan.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Seismic: Per plans and Div 88	108,510	108,510
7. Painting		
Interior	25,850	12,925
Exterior	6,830	-0-
8. Flooring		
Kitchen linoleum	12,760	6,380
Carpet	23,415	11,708
14. Plastering/Drywall Patching		
Repair	15,840	-0-
Seismic	32,957	32,957
15. Tile - Kitchen & Bath	2,200	-0-
18. Plumbing	2,200	-0-
24. Carpentry, general repair	6,600	-0-
Extras:		
Painting	14,706	7,353
Roof	14,605	14,605
Shear Wall Tie-Ins	3,120	3,120
Plaster Repair (seismic)	5,868	5,868
Subtotal		$ 203,426
Overhead and Profit (20%)		40,685
Additional Items not Listed in Cost Summary:		
Footing under shear wall	8,250	8,250
Remove duct work in basement	7,280	7,280
Reconstruct mansard roof	15,430	15,430
Total additional items		$ 30,960

Summary:

Seismic Structural: $ 175,162

Seismic Architectural: $ 99,909

Seismic Total $ 275,071

All Others $ 176,242

Total $ 451,313[3]

V. CONSTRUCTION COST SUMMARY[4]

Items	Cost
Seismic	$ 108,510.00
Fire Alarms	1,745.00
Security Systems	2,900.00
Electrical	32,177.00
Painting (Interior/Exterior)	32,680.00
Flooring (Carpet/Vinyl)	36,175.00
Entry Doors	8,888.00
Interior Repairs	5,095.00
Plastering/Drywall Patch	49,897.00
Tile Work	2,200.00
Windows	3,740.00
Screens	2,160.00
Plumbing	2,200.00
Window Shades	6,160.00
Appliances	4,180.00
Carpentry	6,600.00
Subtotal	$ 305,307.00
Contractor's Profit and Overhead	61,061.40
Subtotal	$ 366,368.40
Extras:	
Paint	14,706.00
Roof	14,605.20
Tub Kits	7,500.00
Door Jambs	2,286.10
Fire Intercom	240.00
Shear Wall Tie-Ins	3,120.00
Bath Details	5,659.00
Plaster Details	5,868.00
Interest	28,133.61
Total	$ 448,486.31

---

3. Total amount does not include interest cost but contains added items listed above.

4. Taken from cost breakdowns in Community Development Department project files.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchors and shear bolts are combined with the use of "T" shaped straps where joists are perpendicular to wall. These are placed on top of sub floor. The combined system for the parallel condition consists of bent plate anchor, strap and blocking. These are placed at mid-depth of joists.

Diaphragm Work

None

Transverse and Longitudinal Brace

Approximate 6 lines of transverse plywood shear wall and 2 walls in the longitudinal direction have been added at the first and second floors. Connection above and below interior partitions have been braced and tied from roof diaphragm to foundation.

Foundation

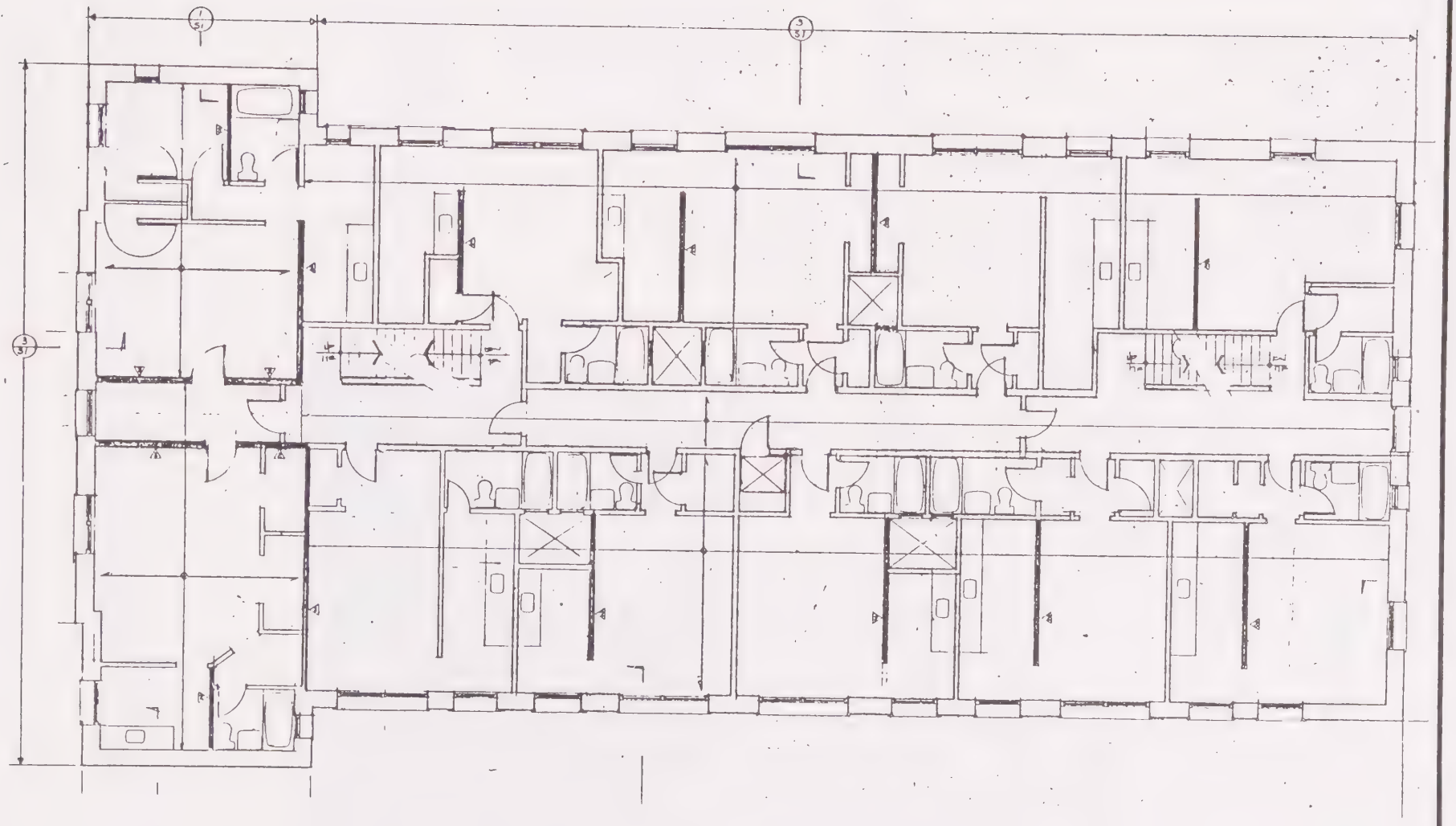
None

General:

Interior Partition	none
Doors and Windows	minor
Walls and Ceiling Surface Repair	major
Flooring and Carpet	major
Painting and Decoration	major
Kitchen and Bath Cabinetry	minor
Kitchen Appliance	minor
Elevator	minor
Plumbing	minor
Kitchen and Bath Fixture	moderate
HVAC	minor
Electrical	major
Site Improvement	none
Security System, Intercom	major
Dorothy Mae Ordinance	major

VII. NOTES:

715 S. St. Andrews is one of two buildings called Wilshire Villas which are financed as a package. Their funding and soft costs are lumped together. These numbers cannot be broken out becuase the grand total for the projects are unclear.



715 ST. ANDREWS TYPICAL PLAN

GEORGE MIERS & ASSOCIATES

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

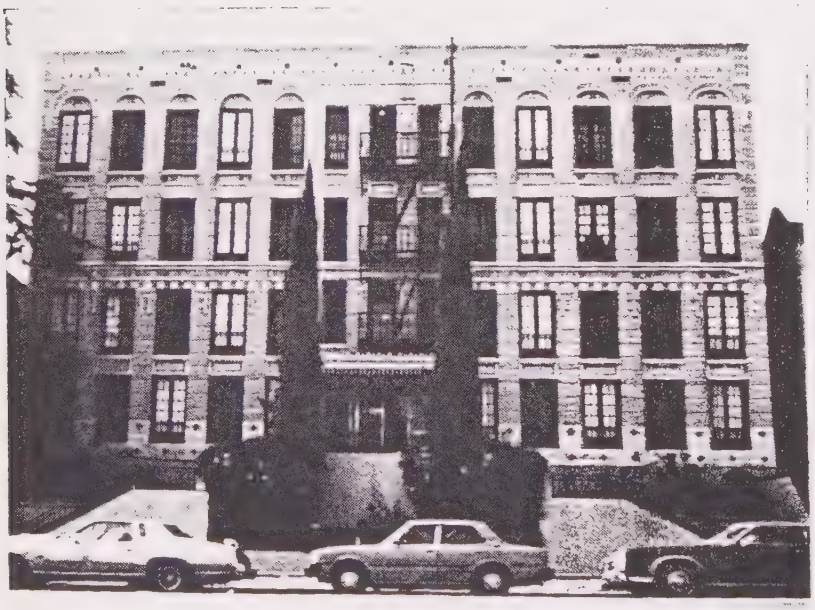
Address: 401 S. Rampart
Owner: C. William Carson
Contractor: C. William Carson
Engineer: CE Group Inc.

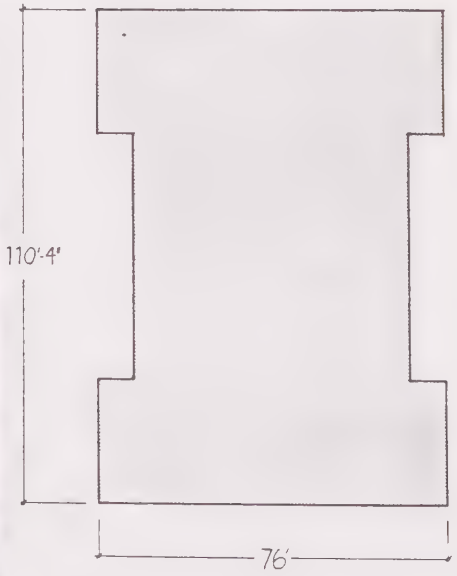
II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 45 Total Floor Area: 21,300[1] Sq. Ft.

Special Conditions/Description:
The building has 4 stories in front and 3 in the rear. Portions of the ground floor are used for entry lobby, manager's office, and storage. The building is unexcavated in the rear.





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1. Square footage does not include storage on the ground floor. The total building area including storage and unexcavated area is 27,200 sq. ft..

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 178,000

B. Source of Funds

Comm. Redevelop.	$ 230,000

Total Funding: $ 230,000

C. Expenditures -

1. Seismic Costs

seismic structural	$ 131,222
seismic architectural	$ 45,470
fees	$ 9,163
profit and overhead	-----[2]
performace bond	-----[2]

Seismic Subtotal: $ 185,855

2. Other Rehab costs:

Other rehab work	$ 34,194
permits	$ 1,650
performance bond	-----[3]
profit and overhead	-----[3]
interest	$ 8,050

General Subtotal: $ 43,894

Total Expenditure: $ 229,749[4]

Seismic Structural: $ 6.48 per/sq. ft.

Seismic Architectural: $ 2.25 per/sq. ft.

Total Seismic Cost: $ 8.73 per/sq. ft. $ 4,425 per/unit

Total Cost: $10.78 per/sq. ft. $ 5,470 per/unit

---

2. Included in seismic structural.

3. Included in other rehab work.

4. Contingency amount not expended applied to repayment of loan.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Anchorage & Shear Bolting	$ 36,586	$ 36,586
2. Diaphragm Strengthening plywd shtg	13,887	13,887
3. Transverse and Longitudinal Bracing		
gunite shear wall	68,797	68,797
plywood shear wall	9,052	9,052
4. Parapet Strengthening	2,900	2,900
5. Architectural Demolition and Refinish		
roof removal and reroof, drywall and plaster, new flooring	28,316	28,316
cieling demo/refinish,	1,750	1,750
finish for shear walls	15,404	15,404
Overhead and profit		included above
Total		176,692[5]

Summary:

Seismic Structural: $ 131,222

Seismic Architectural: $45,470

Seismic Total	$ 176,692
All Others	$ 31,194
Total Constr. Cost	$ 210,886

5. Overhead and profit included in each item.

V. CONSTRUCTION COST SUMMARY[6]

Seismic structural			$ 131,222
Seismic architectural			$ 45,470
Dorothy Mae Orindance			$ 21,272
Other improvements			
insulation	$2,328		
general repairs	$4,200		
carpet	$3,270		
painting	$1,560		
cabinetry	$1,634		
		Subtotal	$ 12,992
		Total	$ 210,886

---

6. Taken from construction summary provided by C. William Carson.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolting were installed in combination using a steel angle and straping. These are placed above the floor diaphragm.

Diaphragm Work

Roof diaphragm was strengthened by the addition of plywood sheathing. Approximately 800 sq. ft. of plywood was also added at the fourth floor cieling.

Transverse and Longitudinal Brace

Four 9 feet gunite walls were added in two lines in the transverse direction on the exterior of the re-entrant corner. Walls are connected to collectors(drag struts) which are existing members except at the roof level. The shear walls also have openings for existing windows. Approximately six bays of windows were filled with reinforced masonry in the longitudinal direction. New 2 inch wood diagonal braces were added at the cieling space at five interior partitions to connect with the roof diaphragm.

Foundation

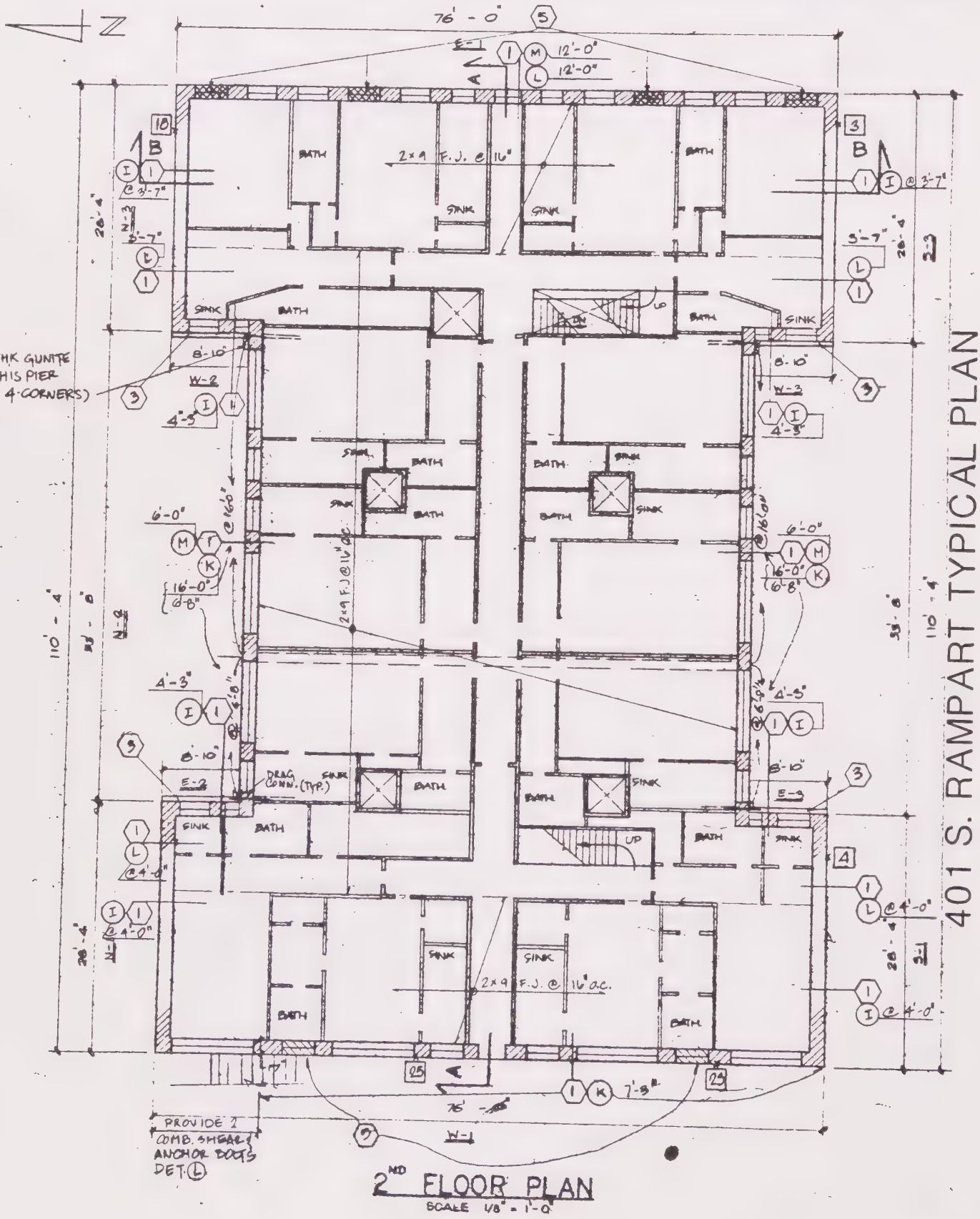
4'-6" wide pad footings were added under new gunite walls.

General:

Interior Partition.....none
Doors and Windows.....none
Wall and Ceiling Surface Repair.....minor
Flooring and Carpet.....minor
Painting and Decoration.....minor
Kitchen and Bath Cabinetry.....none
Kitchen Appliance.....none
Elevator.....none
Plumbing.....none
Kitchen and Bath Fixture.....none
HVAC.....none
Electrical.....none
Site Improvement.....none
Security System, Intercom.....none
Dorthy Mae Ordinance.....major
Miscellaneous.....none

VII. NOTES:

This building was funded totally by the Community Redevelopment Agency and no Davis Bacon wages were required. The owner is a developer who has done several projects of this type. He is also the general contractor.


401 S. RAMPART TYPICAL PLAN
2ND FLOOR PLAN
SCALE 1/8" = 1'-0"
76' - 0"
BATH
SINK
2x9 F.J. @ 16" o.c.
UP
PROVIDE 2 COMB. SHEAR ANCHOR BOLTS DET. (L)
END 4" THK GUNITE COVER THIS PIER (TYP. FOR 4 CORNERS)

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

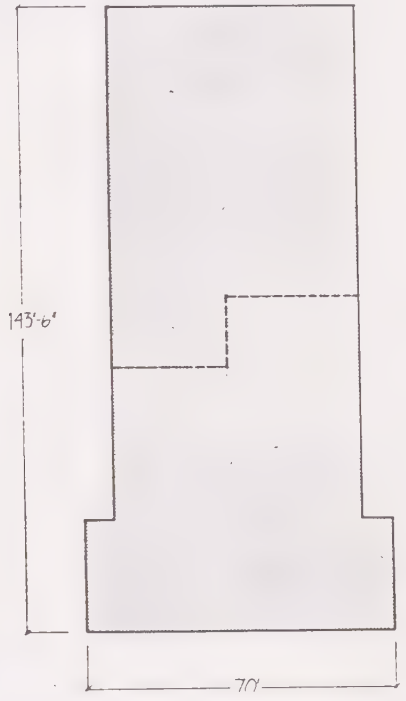
Address:	236 S. Coronado
Owner:	C. William Carson
Contractor:	C. William Carson
Engineer:	CE Group Inc.

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 40 Total Floor Area: 32,000 [1] Sq. Ft.

Special Conditions/Description:
The building is actually five stories in the front and four in the rear. There is a transverse URM wall in the middle of the building which is unusal.



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1. Square footage is measured from plan and does not include 3,000 sq.ft. of storage in the basement. Total area as measured is 35,000 sq.ft..

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 200,000

B. Source of Funds

Comm. Redevelop.	$ 219,000

Total Funding: $ 219,000

C. Expenditures -

1. Seismic Costs

seismic structural	$ 112,921
seismic architectural	$ 36,137
fees	$ 9,472
profit and overhead	-----[2]
performace bond	-----[2]

Seismic Subtotal: $ 158,530

2. Other Rehab costs:

Other rehab work	$ 44,390
permits	$ 1,860
profit and overhead	-----[3]
performance bond	-----[3]
interest	$ 7,665
relocation	$ 1,430

General Subtotal: $ 55,345

Total Expenditure: $ 213,875[4]

Seismic Structural: $ 3.75 per/sq. ft.

Seismic Architectural: $ 1.20 per/sq. ft.

Total Seismic Cost: $ 4.95 per/sq. ft. $ 3,963 per/unit

Total Cost: $ 6.68 per/sq. ft. $ 5,347 per/unit

---

2. Included in seismic structural.

3. Included in other rehab work.

4. Contingency amount not expended applied to repayment of loan.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Anchorage & Shear Bolting	$ 44,130	$ 44,130
2. Diaphragm Strengthening plywd shtg	9,884	9,884
3. Transverse and Longitudinal Bracing		
steel braced frame	6,149	6,149
gunite shear wall	30,301	30,301
plywood shear wall	22,327	22,327
4. Parapet Strengthening	0	0
5. Architectural Demolition and Refinish		
roof removal and reroof, drywall and plaster, new flooring	27,137	27,137
plaster, gas line, refinish shear wall	9,130	9,130
Total		149,058[5]

Summary:

Seismic Structural: $ 112,791

Seismic Architectural: $ 36,267

Seismic Total	$ 149,058
All Others	$ 44,390
Total Constr. Cost	$ 193,448

5. Overhead and profit included in each item.

V. CONSTRUCTION COST SUMMARY[6]

Seismic structural		$ 112,921
Seismic architectural		$ 36,137
Dorothy Mae Orindance		$ 25,343
Other improvements		
insulation	$ 2,445	
replace downspouts	$ 4,601	
hot water lines	$ 7,201	
general repairs	$ 3,700	
carpet	$1,100	
subtotal		$ 19,047
Total		$ 193,448

---

6. Taken from construction summary provided by C. William Carson.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolting were installed in combination using a steel angle and straping. These are placed above the floor diaphragm.

Diaphragm Work

Roof diaphragm was strengthened by the addition of plywood sheathing over the enitre roof.

Transverse and Longitudinal Brace

Two 4 story gunite shear walls, each approximately 7 feet long, have been added at the reentrant corner and are connected with new drag struts to the existing framing. An additional one story gunite shear wall, approximately 32 feet long, has been added in the front ground floor wall. In addition, two lines of plywood shear walls also have been added in the transverse direction, with steel diagonal brace at the basement level.

Foundation

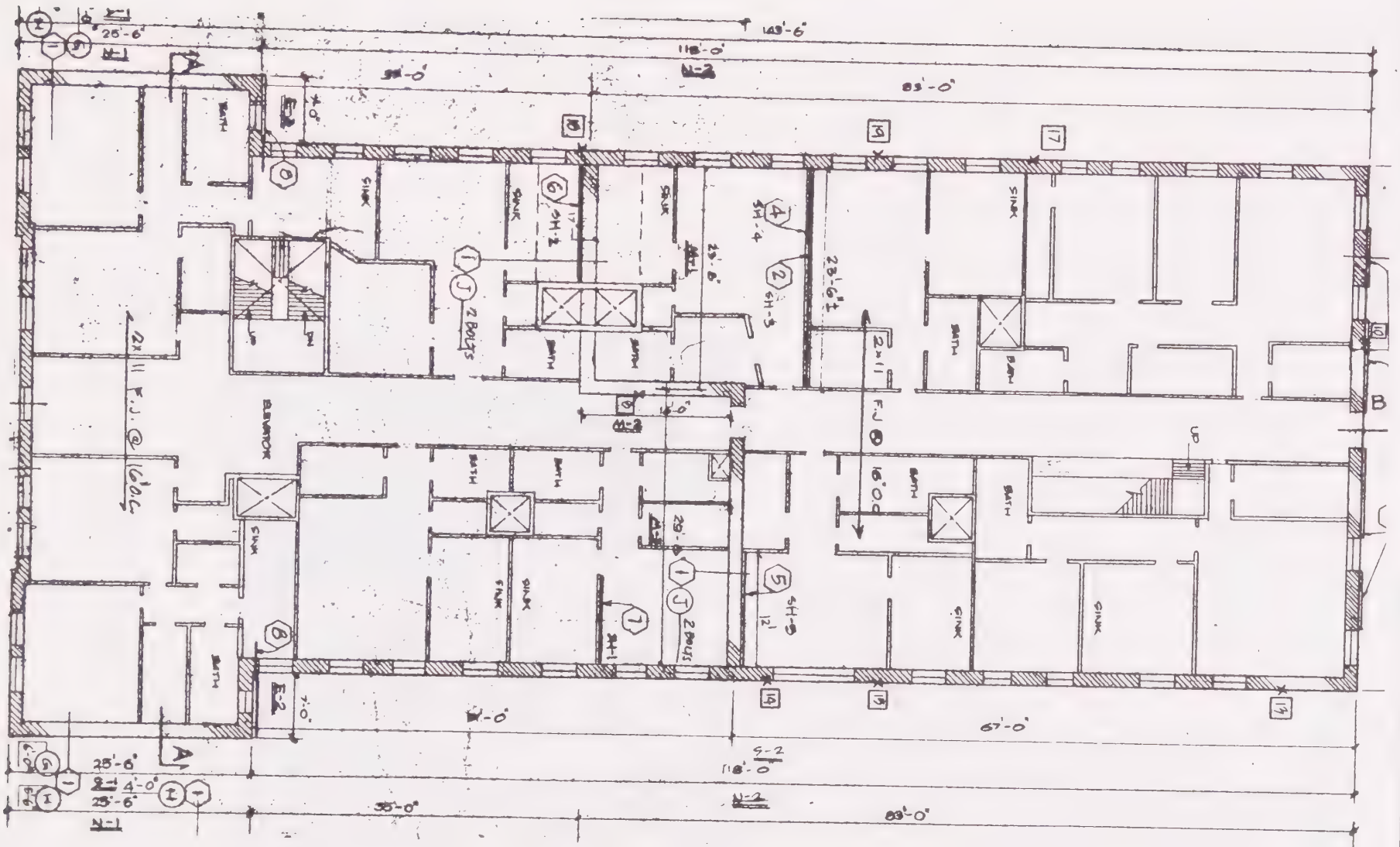
New pad footing under the four story gunites walls have been added as well as new foundation and block walls supporting the new plywood shear walls.

General:

Interior Partition.....none
Doors and Windows.....none
Wall and Ceiling Surface Repair.....minor
Flooring and Carpet.....minor
Painting and Decoration.....minor
Kitchen and Bath Cabinetry.....none
Kitchen Appliance.....none
Elevator.....none
Plumbing.....minor
Kitchen and Bath Fixture.....none
HVAC.....none
Electrical.....none
Site Improvement.....none
Security System, Intercom.....none
Dorthy Mae Ordinance.....major
Miscellaneous.....none

VII. NOTES:

This building was funded totally by the Community Redevelopment Agency and no Davis Bacon wages were required. The owner is a developer who has done several projects of this type. He is also the general contractor.



236 S. CORONADO TYPICAL PLAN

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

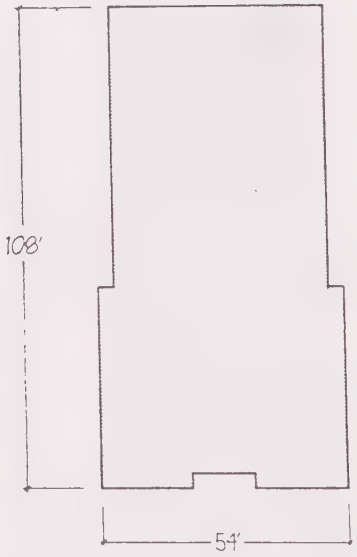
Address: 512 S. Rampart
Owner: C. William Carson
Contractor: C. William Carson
Engineer: CE Group Inc.

II. BUILDING DATA:

No. of stories: 4 Shape: rectangular

No. of units: 26 Total Floor Area: 17,500 [1] Sq. Ft.

Special Conditions/Description:
The building is on a sloping site and only the front half of the first floor is useable floor space. The building also has one interior transverse masonry wall which is unusual. There has been some damage in the back wall due to settlement, which increased retrofit cost.



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1. Square footage does not include storage in the ground floor.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation $ 184,000

B. Source of Funds

Comm. Redevelop.	$ 129,400
Private Funds	$ balance[2]

Total Funding: uncertain[2]

C. Expenditures -

1. Seismic Costs

seismic structural	$ 95,630
seismic architectural	$ 54,295
fees	$ 7,420
profit and overhead	-----[3]
performace bond	-----[3]

Seismic Subtotal: $ 157,345

2. Other Rehab costs:

Other rehab work	$ 26,499
fees and permits	$ 1,923
profit and overhead	-----[4]
interest	$ 4,529

General Subtotal: $ 32,951

Total Expenditure: $ 190,296

Seismic Structural: $ 5.89 per/sq. ft.

Seismic Architectural: $ 3.10 per/sq. ft.

Total Seismic Cost: $ 8.99 per/sq. ft. $ 6,052 per/unit

Total Cost: $10.87 per/sq. ft. $ 7,319 per/unit

---

2. The rest of the cost is covered by the owner's private financing.

3. Included in seismic structural.

4. Included in other rehab work.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Anchorage & Shear Bolting	$ 32,835	$ 32,835
2. Diaphragm Strengthening plywd shtg	7,260	7,260
3. Transverse and Longitudinal Bracing		
steel moment frame	22,953	22,953
repair existing masonry	22,032	22,032
plywood shear wall	8,650	8,650
4. Parapet Strengthening	1,900	1,900
5. Architectural Demolition and Refinish		
roof removal and reroof, drywall and plaster, new flooring	29,564	29,564
plaster, gas line, drywall, soffits	23,931	23,931
Total		149,125[5]

Summary:

Seismic Structural: $ 95,630

Seismic Architectural: $ 53,495

Seismic Total	$ 149,125
All Others	$ 26,499
Total Constr. Cost	$ 175,624

---

5. Overhead and profit included in each item.

V. CONSTRUCTION COST SUMMARY[6]

Seismic structural		$ 95,630
Seismic architectural		$ 54,295
Dorothy Mae Orindance		$ 21,530
Other improvements		$ 4,969
	Total	$ 176,424

---

6. Taken from construction summary provided by C. William Carson.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolting were installed in combination using a steel angle and straping. These are placed above the floor diaphragm.

Diaphragm Work

Roof diaphragm was strengthened by the addition of plywood sheathing.

Transverse and Longitudinal Brace

One line of transverse bracing has been added at the interior masonry wall, which consist of a 3 story moment frame and plywood shear wall on the fourth floor. Center window bay of the front facade has been partially filled with reinforced masonry at the top three floors. Rear wall has been extensively repaired due to a settlemement problem. Two lines of plywood shear wall have been added at the two sides of the longitudinal center corridor. Two windows on the fourth floor have been filled.

Foundation

Footing under steel frame was added.

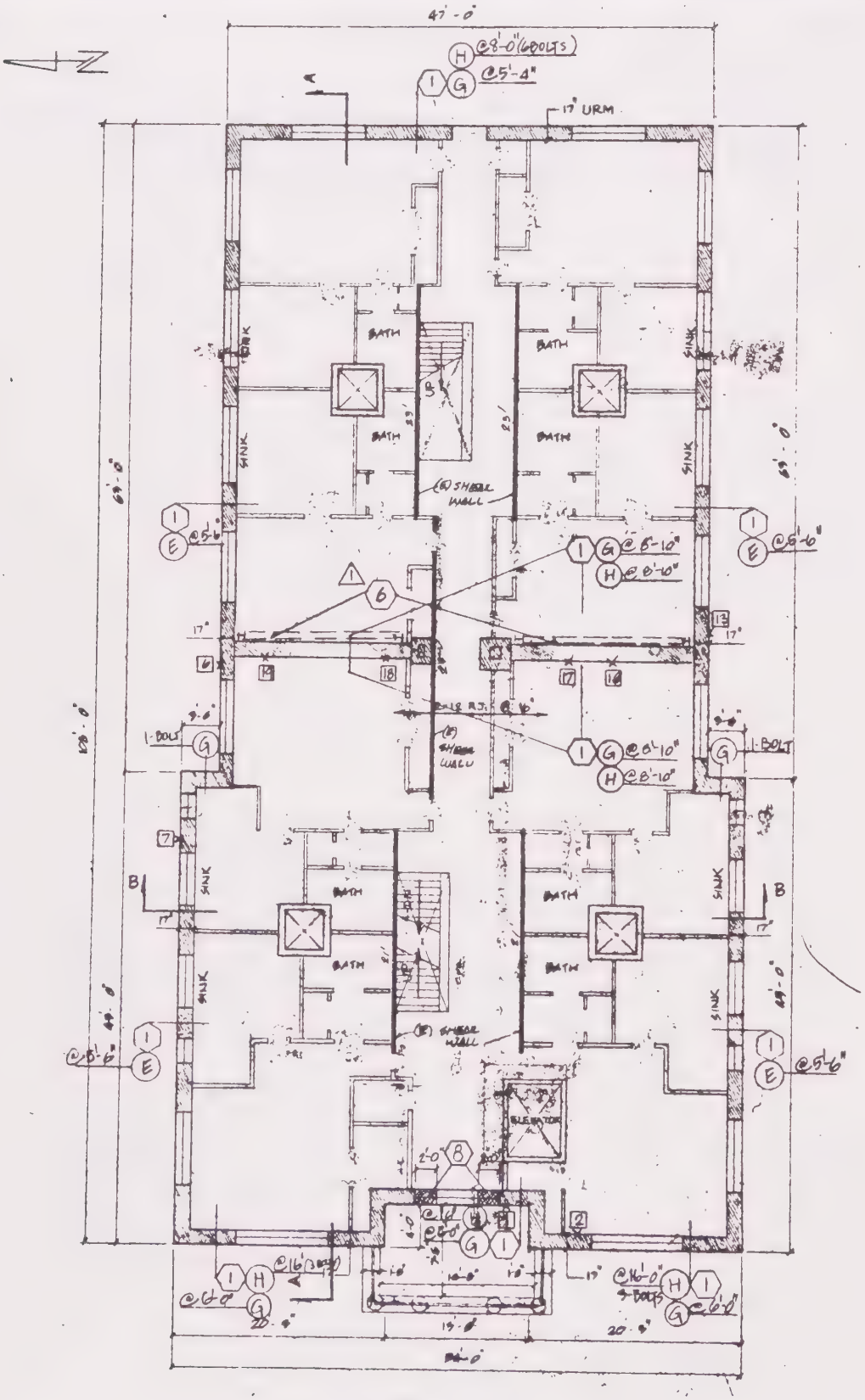
General:

Interior Partition.....none
Doors and Windows.....none
Wall and Ceiling Surface Repair.....minor
Flooring and Carpet.....none
Painting and Decoration.....none
Kitchen and Bath Cabinetry.....none
Kitchen Appliance.....none
Elevator.....none
Plumbing.....none
Kitchen and Bath Fixture.....none
HVAC.....none
Electrical.....none
Site Improvement.....none
Security System, Intercom.....none
Dorthy Mae Ordinance.....major
Miscellaneous.....none

VII. NOTES:

This building was funded totally by the Community Redevelopment Agency and no Davis Bacon wages were required. The owner is a developer who has done several projects of this type. He is also the general contractor.

512 S. RAMPART TYPICAL PLAN



2ND FLOOR PLAN

SCALE 1/4" = 1'-0"

SEISMIC UPGRADE COST SURVEY

I. PROJECT INFORMATION:

Address:	Building B
Owner:	not available
Contractor:	American International Construction
Engineer:	not available

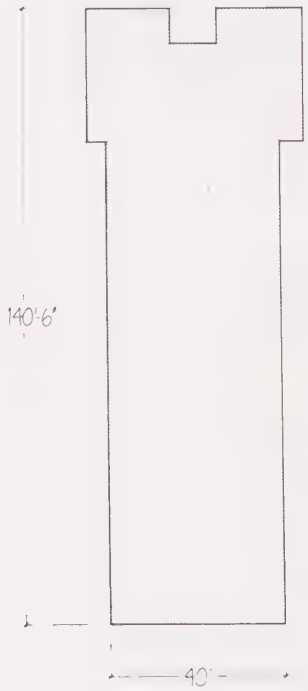
II. BUILDING DATA:

No. of stories: 3 Shape: rectangular

No. of units: 30 Total Floor Area: 17,400[1] Sq. Ft.

Special Conditions/Description:
RGA method is used for the strengthening design.

Photo not Available



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1. Square footage is measured from plan and includes 1,300 sq.ft. of useable space in the basement.

III. FINANCIAL SUMMARY:

A. Building and Safety Permit Valuation uncertain

B. Source of Funds
private source uncertain[2]

Total Funding: uncertain[2]

C. Expenditures -

1. Seismic Costs

seismic structural	$ 83,960
seismic architectural	$ 4,000
permits and fees	$ -----[3]
profit and overhead	-----[3]
performace bond	-----[3]

Seismic Subtotal: $ 87,960

2. Other Rehab costs:

Other rehab work	$ 0

General Subtotal: $ 0

Total Expenditure: $ 87,960

Seismic Structural: $ 0.23 per/sq. ft.

Seismic Architectural: $ 4.83 per/sq. ft.

Total Seismic Cost: $ 5.05 per/sq. ft. $ 2,932 per/unit

Total Cost: $ 5.05 per/sq. ft. $ 2,932 per/unit

---

2. We assume private financing was used to cover the entire cost of project.

3. Included in seismic structural.

IV. BREAKDOWN OF SEISMIC COST:

Items	Contract Amount	Amount Attributed to Seismic
1. Deposit	6,000	6,000
2. Submit to plan check	3,000	3,000
3. Approval	6,000	6,000
4. Concrete Footing	3,560	3,560
5. Install plywood	12,000	12,000
6. Basement shearwall	8,750	8,750
7. Roof/attic connection	6,250	6,250
8. Drilling holes	8,500	8,500
9. Dry pack	6,500	6,500
10. Set anchors	11,600	11,600
11. Parapet braces	3,000	3,000
12. Roof replacement	1,000	1,000
13. Drywall and paint	3,000	3,000
14. Maonry Infill	1,500	1,500
15. Supervision	6,000	6,000
subtotal		$ 86,660
Overhead and profit		included above
Change Orders (approximately 1.5%)		1,300

Summary:

Seismic Structural:	$ 83,960	
Seismic Architectural:	$ 4,000	
Seismic Total		$ 87,960
All Others		$ 0
Total Constr. Cost		$ 87,960

V. CONSTRUCTION COST SUMMARY[4]

1.	Deposit	$ 6,000
2.	Submit to plan check	3,000
3.	Approval	6,000
4.	Concrete Footing	3,560
5.	Install plywood	12,000
6.	Basement shearwall	8,750
7.	Roof/attic connection	6,250
8.	Drilling holes	8,500
9.	Dry pack	6,500
10.	Set anchors	11,600
11.	Parapet braces	3,000
12.	Roof replacement	1,000
13.	Drywall and paint	3,000
14.	Maonry Infill	1,500
15.	Supervision	6,000
	subtotal	$ 86,660
Overhead and profit		included above
Change Orders (approximately 1.5%)		$ 1,300
	Total	$ 87,960

4. Taken from construction summary provided by American International Construction.

VI. SCOPE OF REHABILITATION:

Seismic:

Anchorage and Shear Bolt

Anchor and shear bolting were installed in combination using a steel angle and straping. These are placed above the floor diaphragm.

Diaphragm Work

None

Transverse and Longitudinal Brace

Four lines of plywood panels have been added in the transverse direction in the first floor. New wood cross braces were added at the attic level to connect to roof diaphragm.

Foundation

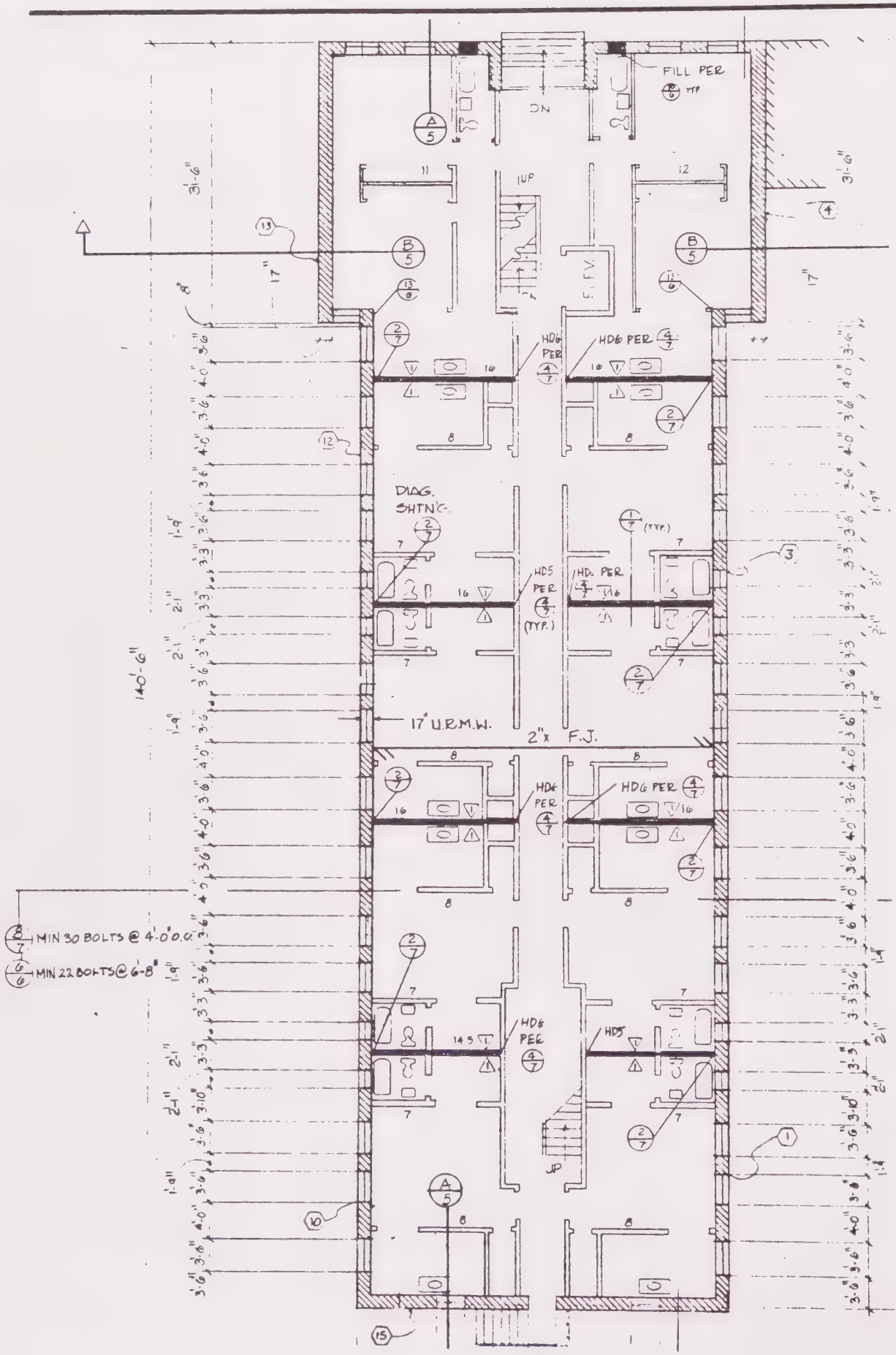
New 2' X 2'foundation has been added under new plywood paneled walls.

General:

Interior Partition	none
Doors and Windows	none
Wall and Ceiling Surface Repair	minor
Flooring and Carpet	none
Painting and Decoration	minor
Kitchen and Bath Cabinetry	none
Kitchen Appliance	none
Elevator	none
Plumbing	none
Kitchen and Bath Fixture	none
HVAC	none
Electrical	none
Site Improvement	none
Security System, Intercom	none
Dorthy Mae Ordinance	none
Miscellaneous	none

VII. NOTES:

Total construction time was 8 to 9 weeks.



BUILDING B TYPICAL PLAN

LIST OF OWNERS, ENGINEERS, AND CONTRACTORS

Owners:

Eldon Perry (213) 278-1298

JRAM- Terry Chin (818) 360-2435

Richard Kaplan (213) 387-4213
20243 Chapter Drive
Woodland Hills, CA 91364

Devinder Vadehra (213) 389-1204
American Redevelopment Corp.
3435 Wilshire Blvd. #214
Los Angeles, CA 90010

Thomas Bell (818) 509-0909
Scenic Sites
4400 Coldwater Canyon #200
Studio City, CA 91640

C. William Carson (213) 456-8652
P.O. Box 116
Malibu, CA 90265

Engineers:

Wheeler and Gray
Consulting Engineers (213) 256-2101
7462 N. Figueroa St.
Los Angeles, CA 90041

ADS Assoc.
Design & Engineering

Joseph Zelner and Assoc. (818) 986-6682
14241 Ventura Blvd.
Sherman Oaks, CA 91423

CE Group, Inc. (213) 381-3865
611 S. Catalina St. #216
Los Angeles, CA 90005

Contractors:

Alta Construction Co.	(213) 662-0955
Lehigh Construction Co. 15130 Ventura Blvd. #218 Sherman Oaks, CA 91403	(818) 784-0999
PARCCO General Contractors 1914 S. Vermont Ave. Los Angeles, CA 90007	(213) 734-3666
A. T. Biddle Construction 11749 Minuteman Dr. Riverside, CA 92503	(714) 351-4163
Irving Yura American International Constr. 9165 W. Sunset Blvd. #205 Los Angeles, CA 90069	(213) 273-7977
Alpha Construction	

GLOSSARY

Building Footprint Size - The ground floor area of a structure. For example, a four story building and a one story building may have the same footprint size but different total floor area.

Hazardous Buildings - In this report, this term refers to buildings which are vulnerable to collaspe or partial collaspe in major earthquakes, and they are therefore hazardous as potential life-loss situations.

Irregular Configuration - Buildings which are not roughly rectangular in plan, or which steps in or out in the elevation. "Irregular configuration" in this report refers to buildings with long clear wings, large interior atriums, large steps in elevation, or other major structural irregularities. This does not include small protruding bays or lightwells.

Mixed-Use - Buildings containing two or more occupancies. For example, a building with commercial retail stores on the ground floor and residential units above is a mixed-use occupancy.

Re-entrant Corner - The inside corner where wings or portions of buildings join.

Seismic Architectural Cost - The cost of architectural demolition and refinishing as a result of earthquake upgrading which may include the cost of drywall, painting, carpet, and reroofing.

Seismic Structural Cost - The cost of the structural components required in earthquake upgrading which may include the cost of installing anchors, diaphragms, shearwalls, and foundations.

Unreinforced Masonry - Brick, Stone, or ceramic tile elements which has not been reinforced by steel.

ABOUT THE AUTHOR

Mary C. Comerio is a principal in the architectural firm, George Miers and Associates in San Francisco as well as an Associate Professor of Architecture at University of California, Berkeley. In addition to her work on the programming and design of housing and community facilities, she has been involved in research on Earthquake Hazards and Housing for several years. Some of her publications in this area are:

Earthquake Hazards and Housing vol. 1 & 2, San Francisco Department of City Planning, 1987.

This extensive research study examines optional methods of seismic upgrading in URM multi-unit housing and evaluates the social and economic impact of a retroactive ordinance on building owners and tenants.

"Seismic Sanity: Somebody Else's Problem" Proceedings of the Seminar on Aspects of Seismic Risk in the New Madrid Fault Region ASCE & AIA, St. Louis, Missouri, 1984.

and

"Saving Face, Saving Lives, or Saving Neighborhoods: Dealing with the Earthquake Problems in the Community," Workshop on the Seismic Upgrading of Existing Buildings NSF and Center for Environmental Design Research, UC Berkeley, 1982.

Both of these articles examine the issues and questions involved in developing local government policy to regulate seismic hazards.

Earthquake Hazards and Wood Frame Houses and An Earthquake Advisors' Handbook Center for Environmental Design Research, UC Berkeley, 1982.

Both books provide detailed technical information on seismic upgrading for wood frame houses in California. Portions of these publications have been reprinted in Rehab Right, a "how-to" manual published by 10 Speed Press.